ARMY RESEARCH AND DEVELOPMENT

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3 Cold Weather Test Centers Plan Moves

Theme of the Month

By Richard S. Morse, Director
Research and Development, Department of the Army

The present expanding rate of scientific progress and its military implications place before the Army R&D team one of the most challenging tasks in history. Technological explosions are promising to reshape our world either for good or for bad. World leadership unquestionably will rest with that nation which excels in, and has the leadership to utilize most effectively, science and technology. The Soviet Union, long ago, accepted this premise and subsequently has been driving with deliberate purpose toward attainment of world leadership and an increased standard of living for its own people, through the medium of organized technology. Its people have been forced to ever greater effort and individual sacrifice, and its science and technology have been force-fed by mass education and modern industrial techniques. Its resources have been carefully channeled into those avenues most productive in war-making potential.

Military science and technology already have given birth to radically new weapons systems which minimize the effectiveness of conventional systems. With such a trend, a leisurely "business-as-usual" approach would be suicidal. If America is to survive, we must constantly improve the effectiveness of our over-all research and development efforts. The key role that Army R&D plays in achieving this goal is obvious.

The race to achieve and maintain supremacy in military research and development is challenging and demanding. But it is also vital because of its urgency and fatefulness. The Army research program spans the whole spectrum of scientific endeavor, including the many facets of missile development, imaginative satellite systems, advanced concepts of ground vehicles and relatively new light aircraft, to name only a few. The race is also rewarding because, if well run, it will produce benefits of tremendous significance to every American, both militarily and for his daily life. A true sense of achievement then can be the reward of the Army R&D team.

The famous English philosopher, John Stuart Mill, in discussing the effects of science on human life, and the social and economic implications of technology, said of those contributing to the betterment of mankind's state in scientific fields, ". . . Every mind sufficiently intelligent and generous to bear a part, however small and inconspicuous, in the endeavor, will draw a noble enjoyment from the contest itself, which he would not for any bribe in the form of self-indulgence consent to be without. . . ."

This statement applies to the individuals of our R&D team. It may be noted that John Stuart Mill made this observation before scientific advances had even suggested that nations would develop the power to destroy one another. This overshadowing fact places a high premium on success in our endeavor; and we have an additional incentive and reward, derived from the very great role we are playing in perpetuating Western civilization.

Relocation of three major U.S. Army cold weather environmental research facilities, aimed at speeding up development by placing engineering and user test activities closer together, physically and with respect to time, is scheduled for completion by late 1961.

Involved in the changes approved by Lt Gen Arthur G. Trudeau, Chief of Research and Development, are the engineering test installations at Fort Churchill, Canada, the Corps of Engineers' Snow, Ice and Permafrost Research Establishment (SIPRE) at Wilmette, Ill., and the Arctic Construction and Frost Effects Laboratory (ACFEL), Waltham, Mass.

Testing activities at Fort Churchill, except for continued upper atmosphere experiments with rockets and balloons started during the International Geo-

(*Continued on Page 2*)

HumRRO Parley Discusses 7-Year Research Program

Army requirements for research during the next seven years on training, motivation, leadership, and man-machine systems were discussed at a 2-day conference Nov. 16–17 at George Washington University, Washington, D.C.

Sponsored by the university's Human Resources Research Office, the planning conference included approximately 100 participants from the university, Department of the Army, and Headquarters, United States Continental Army Command. The university's acting president, O. S. Colclough, Vice Admiral, USN (Ret.), served as host for the conference.

Topics for discussion included: the role of the Army in modern war; the Army's system for planning; trends in organization, doctrine, and tactics; projections of personnel requirements and problems; requirements for the intelligence system of the future Army; military assistance training programs, and major system developments in the Ordnance Corps, Corps of Engineers, Signal Corps, Chemical Corps, and Transportation Corps.

Army R&D Newsmagazine

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Objectives of this publication are: To improve informal communication among all segments of the Army scientific community and other Government R&D agencies: to further understanding of Army R&D progress, problem areas and program planning; to stimulate more closely integrated and coordinated effort among the widely dispersed and diffused Army R&D activities; to maintain a closer link from top management through all levels to scientists, engineers and technicians at the bench level; to express views of leaders, as pertinent to their responsibilities, and to keep personnel informed on matters germane to their welfare and pride of service.

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Submission of Material: All articles submitted for publication must be channeled through the technical liaison or public information officer at installation or command level.

RCA Gets $1,995,000 Contract

The Army recently announced award of a $1,995,000 contract to Radio Corporation of America, Defense Electronics Products, Morristown, N.J., for research and development on Project DAMP (Downrange, Anti-missile Measurements Program). The contract was awarded by the Philadelphia Ordnance District.

3 Cold Weather Test Centers Plan Moves

(*Continued from Page 1*)

physical Year, will be moved to Alaska. SIPRE and ACFEL will be merged into a new facility named the Cold Region Research Engineering Laboratory (CRREL) at Hanover, N.H.

Historic Fort Greely, long an Army arctic outpost, and Ladd Air Force Base, 110 miles farther north and due for turnover to the Army effective Jan. 1, 1961, are being considered for transfer of the permanent test teams at Fort Churchill. Ordnance, Quartermaster and Engineer Corps teams are classified as permanent while Signal Corps and Medical Service activities are conducted on a temporary duty basis.

Only 40 of the 400 permanent American personnel (military and civilian) now stationed at Fort Churchill will be shifted in the relocation to Alaska, an Army spokesman said. Beginning on or about Nov. 1, 1961, the 100-man force of temporary duty personnel required only during the winter testing period will be assigned to the new Alaskan facility.

Although the primary purpose of the move to Alaska is to place the environmental test teams of the Engineer, Ordnance and Quartermaster Corps near operations of the U.S. Continental Army Command's Arctic Test Board at Fort Greely, the teams will remain under control of Technical Services Chiefs. Transfer of the teams will begin in April or May, at the end of the winter testing season. Since facilities available at either Fort Greely or Ladd AFB will necessitate little new construction, the teams are expected to be fully operational by Nov. 1.

Decision to move test activities from Fort Churchill was based on recommendations of representatives of the Office of the Chief of Research and Development who accompanied a team of Army General Staff officers to Alaska in connection with the transfer of Ladd AFB. Maj Gen Lyle E. Seman, Director of Installations, Deputy Chief of Staff for Logistics, headed the team.

First used by the United States on a guest basis in 1942, as part of the "Crimson Staging Route" for the aerial evacuation of World War II wounded from Europe, Fort Churchill, a Canadian Army post, became a U.S. Army cold weather experimental station in 1946. The Engineer Research and Development Laboratories arctic test detachment was placed under the administrative support of the Commanding General, Military District of Washington, D.C., in 1947.

Located on the shore of Hudson Bay, between the subarctic forest and the tundra zone, Fort Churchill through the years has served as an example of the cordiality of U.S.-Canadian relations in the pursuit of scientific research. In the extreme weather conditions of the area, the toughest metals may become brittle, auto tires turn into steel-hard hoops, lubricants freeze into useless solids, human flesh becomes frostbitten in seconds. The Army has tested all types of cold weather equipment—mines and explosives, weapons and ammunition, vehicles and construction machinery, communications, medical techniques, materials, food, clothing, and shelters.

In 1956 the U.S. Army Corps of Engineers, as a part of United States and Canadian Government cooperation in planning participation in International Geophysical Year activities, constructed a rocket firing facility for upper atmosphere research at Fort Churchill. Rocketry experiments there received worldwide attention through joint efforts of the U.S. Army, Air Force, Navy and top ranking scientists of major universities. Tests represented a substantial part of the U.S. IGY upper atmosphere research program. Experiments are being continued under Department of Defense and National Aeronautics and Space Administration supervision.

Establishment of CRREL

The decision to establish the Cold Region Research Engineering Laboratory at Hanover, N.H., as a consolidation of the Snow, Ice and Permafrost Research Establishment and the Arctic Construction and Frost Effects Laboratory, is the culmination of studies initiated in 1953. Possible sites throughout the northern part of the U.S. were surveyed with respect to existing and potential advantages.

Selection of the Hanover site was influenced partially by the polar library and research laboratory at nearby Dartmouth College, which donated off-campus acreage for the new establishment and will permit siting of observation posts on its extensive land holdings. The New England region climate is favorable to research requirements. In the area are the U.S. Army Quartermaster Research and Engineering Center at Natick, Mass., the Massachusetts Institute of Technology Laboratories, and the Air Force Laboratory at Cambridge, Mass.

CRREL's mission basically, will be to amass and evaluate results of worldwide arctic scientific studies and contract research work on 21 American educational institutions, with the purpose of providing the Army maximum capability to live and fight in the most frigid regions of the world.

DOFL Noted for Key Role in Defense R&D

The Diamond Ordnance Fuze Laboratories (DOFL), a Federal Government research, development and industrial engineering organization, operates as a component of the Ordnance Corps, Department of the Army. The services and facilities of the Laboratories are available to all the military services, to Federal scientific agencies and, in special instances, to nongovernment organizations acting privately or as Federal contractors.

DOFL was organized originally to perform the ordnance development activities of the National Bureau of Standards (NBS). Work for the Army Ordnance Corps was conducted at NBS, under the leadership of Harry Diamond until his death in 1948, and it resulted in a series of successful proximity fuzes. DOFL joined the Army Ordnance Corps in 1953, and became one of the major Army technical laboratories.

Among World War II weapon developments, the proximity fuze is considered by many to be second only to the atomic bomb in military importance, and its existence was a closely guarded secret until the end of the war.

Technical Director W. S. Hinman

DOFL has a creative force of scientists, engineers, skilled craftsmen and supporting personnel numbering almost 1,400. Its staff integrates both government and industrial backgrounds. Invaluable experience is being acquired constantly as a result of extensive in-house research and development work. DOFL has frequently worked in close cooperation with other government agencies, and with industrial and educational institutions in carrying out research, development and production engineering.

Lt Col R. W. McEvoy
Commanding Officer, DOFL

DOFL is generally conceded to be thoroughly qualified to understand, collaborate with and supervise industrial contractors in many specialized areas. Its wealth of specialized knowledge and wide experience is centered in creative thinking—and the ability to translate this rapidly into hardware of landmark quality. Advanced ideas and inventive thinking are specifically oriented toward the needs of the ultimate user.

Illustrating this, ammunition concepts in electronic packaging, printed circuits, microminiaturization, casting resins, flow and temperature measurement systems, reserve power supplies, high-resolution radar, air navigation systems, telemetering equipment, nuclear effects studies, and the revolutionary fluid amplifier are all major areas where DOFL productivity has made significant contributions to the national capability.

Specifically, the Commanding Officer, Diamond Ordnance Fuze Laboratories, has been assigned the responsibility for and delegated authority to:

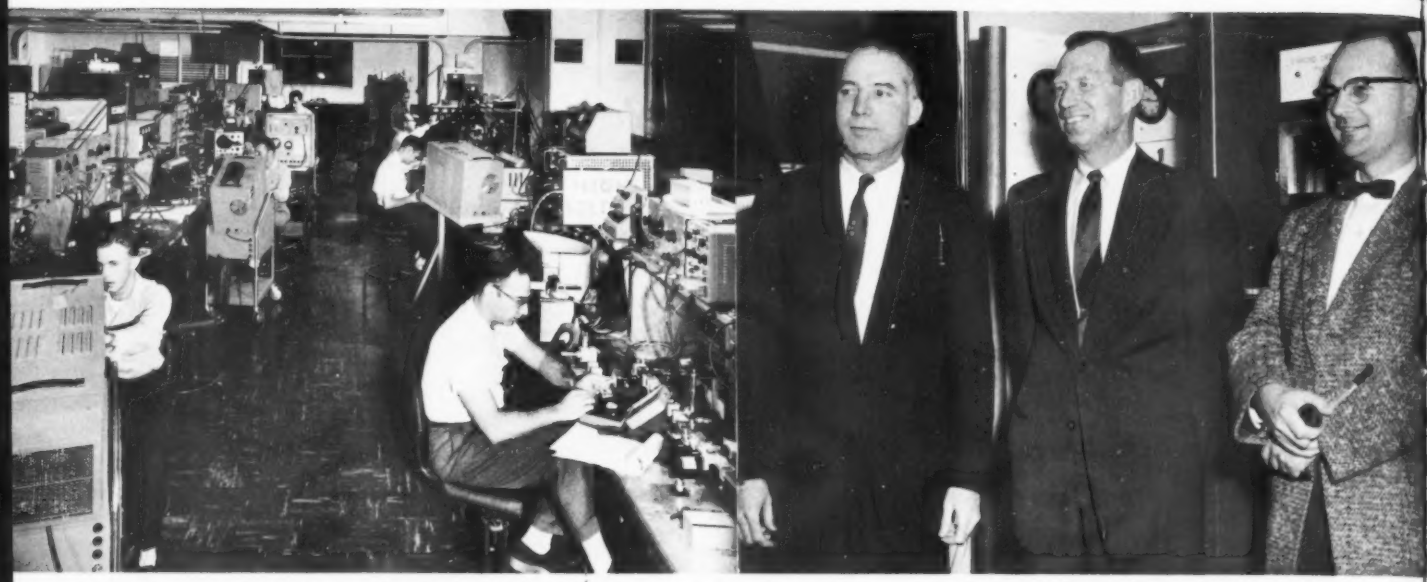
1. Perform the National Development Mission for proximity fuzes.
2. Conduct research and development in the various physical science and engineering fields directed toward meeting the military characteristics for fuzes and related items.
3. Provide consulting and liaison services as required in connection with development, production, and use of items developed in the laboratories or of related items.
4. Fabricate models and prototypes of items under development at the laboratories.
5. Perform developmental testing, including destructive testing of prototypes.
6. Perform the Industrial Engineering Support Mission for proximity fuzes.
7. Maintain and operate for OCO a complete library of technical and progress reports prepared principally by the Ordnance Corps and its contractors.
8. Serve as principal Ordnance Nuclear Radiation Effect Research group to investigate and determine susceptibility of Ordnance electronics materiel to nuclear weapons radiation environment, mechanisms of effect, and ways and means of developing less susceptible materiel.
9. Administer the Department of the Army Regional Training Center for the District of Columbia, Virginia and Maryland area.

Associate Director Hoyt W. Sisco

DOFL has been organized into four major technical areas, namely, Advanced Research, Supporting Research, Development and Engineering. This arrangement enhances in-house capabilities across scientific lines. The supporting administrative services function as such under an Associate Director for Administration who is closely connected with the Commanding Officer and the Technical Director in the day-to-day operation of the Laboratories.

DOFL's technical competence is exemplified by imaginative innovations. Personnel often establish new trends in electronic and mechanical design. The abilities supporting such accomplishments provide the Diamond Ordnance Fuze Laboratories with a unique potential for further progress.

Innovations of Great Impact Credited to DOFL



Left, typical electronics laboratory bay at the Diamond Ordnance Fuze Laboratories, Washington, D.C. Right, exemplifying the "team" concept at DOFL, B. M. Horton, physicist, R. Warren, mechanical engineer, and Dr. R. L. Bowles, aerodynamicist, invented the revolutionary system of fluid amplifiers which has excited wide interest.

Astronautical Society Meets in Dallas, Jan. 16–18

Brig Gen Donald E. Flickinger, Assistant to the Commander, Air Force Research and Development Command, Andrews Air Force Base, Md., will receive the Melbourne W. Boynton Award for Space Medicine at the seventh annual meeting of the American Astronautical Society to be held in Dallas, Tex., Jan. 16–18. He was selected for his work in bioastronautics.

The second principal award to be made by the Society, the Space Flight Award, will go to Dr. Homer E. Newell, Jr., Deputy Director of the National Aeronautics and Space Administration's Office of the Space Flight Program.

The Society will name 13 new Fellows of the organization. These will include Dr. Hans K. Ziegler, Chief Scientist, and Mr. Peter T. Maresca, Chief, Astro-Communications Branch, U.S. Army Signal Corps Research and Development Laboratory, Fort Monmouth, N.J.

Maj Gen William W. Dick, Jr., Deputy Chief, Office of the Chief of Research and Development, is chairman of the committee on awards, which will be presented at a dinner Jan. 18.

During the 3-day meeting some 50 papers, selected from 150 abstracts, will be presented. These will cover virtually every aspect of the astronautical sciences. In addition, leading authorities on the nation's various space programs will take part in a forum appraisal of these programs. Participants will include representatives of the civilian space agency, the military, the scientific community and industry.

AR Covers Atomic Reactors

Army Regulation 700–25, now in distribution, prescribes policies governing authorization, acquisition and accounting procedures for atomic power reactors and special nuclear material. The regulation fixes responsibility in this area on the U.S. Army Chief of Engineers.

$199 Million Nike-Zeus Contract

A $199,125,000 Nike-Zeus research and development contract has been awarded to the anti-missile missile system's prime contractor, Western Electric Co., by the New York Ordnance District.

Standard Filters Promise Clean Jet Motor Fuel

Development of a family of standard filter/separators by the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va., is expected to eliminate the long-standing problem of insuring "clean" fuel for military aircraft and other vehicles.

Experimental models of standard filter/separators in 50, 300 and 600 g.p.m. sizes are under evaluation in the Laboratories' test facility. On the basis of satisfactory preliminary test results, 17 additional units were ordered for delivery to appropriate military units for evaluation under field conditions.

The advent of jet aircraft has aggravated the problem of engine fuel contamination by water and solids. Military jet engines and fuel system have low contamination tolerances and jet fuel retains contaminants to a greater degree than gasoline.

Commercially available filter/separators can be modified and improved to meet necessary military requirements, but this equipment varies considerably in shape and size details. This variation prevents the use of contaminant removal media produced by one manufacturer within the vessel produced by another, creating an undesirable replacement problem in the field.

AMS To Review Studies At 41st Annual Meeting

Wide-ranging examination of current meteorological studies by leaders in the field is on the program of the 41st annual meeting of the American Meteorological Society to be held in New York City Jan. 23–26.

During the meeting the AMS will hold a joint panel session with the Institute of the Aerospace Sciences to discuss meteorological satellites. The Society also will join the New York Academy of Sciences in its symposia on solar variations, climatic change and related geophysical problems, to be held Jan. 24–28.

Mary Norton Rates Recognition for 32 Years Of Research in Field of Ordnance Materials

Increasing importance of the role of women in Army science is well illustrated by Mary R. Norton, a member of the staff of the Materials Research Laboratory, Ordnance Materials Research Office, since its inception in 1954, and a scientist in the employ of Army Ordnance for almost 32 years.

Educated at Emmanuel College, Boston, (A.B., 1926, Chemistry and Mathematics), and Columbia University, New York, (M.A., 1928, Chemistry), she subsequently attended courses related to her work at Harvard School of Engineering, Lowell Institute and Massachusetts Institute of Technology.

As a student Miss Norton had no plans to enter the employment of the Federal Government nor was she aware of any opportunities in that service. Prior to, during, and after her graduate studies she worked both in the control laboratory and in the research laboratory of the former Merrimac Chemical Company, North Woburn, Mass. Undoubtedly she would have remained in that field of activity had not an unforeseen chain of circumstances occurred at Watertown Arsenal in 1928.

General T. C. Dickson, Commanding Officer, had among his consultants Dr. F. F. Lucas of the Bell Telephone Laboratories. Lucas, through the use of exceptionally high resolution (for that time) microscopy, had been uncovering exciting new facts about the microstructures of metals. Intrigued by the potential advantages of similarly investigating Ordnance steels, General Dickson established separate facilities for high resolution metallography in the Watertown Arsenal Laboratories. He ordered that the new facilities should duplicate those of Dr. Lucas even to the extent of including a woman assistant with an education in science.

Eventually, after Watertown officials communicated with the job placement authorities at several colleges, Mary Norton was recruited to be trained for the new assistantship. This was her introduction to the metallurgical microscope and the start of a long, fruitful, and happy career of discovery in Army research and development.

In the years that followed, Mary Norton was given the opportunity to make microstructural studies of an endless variety of ferrous and some nonferrous metals and alloys associated with Ordnance requirements. Her work became recognized for its high quality. Many demands were made to permit her to study special problems for other organizations such as the United States Geographical Survey, the United States Navy Bureau of Ships, the United States Naval Torpedo Station, Harvard Observatory, and even independent industrial laboratories.

Mary R. Norton

The ultimate resolving power of the visible light microscope (for opaque materials) was realized through her exceptional skill. Today, when it has been seemingly brushed aside by more powerful and glamorous instruments, she still tries to keep other workers aware of the important role of the visible light microscope under the proper circumstances.

One of the earliest lessons learned by Mary Norton was that successful high resolution microscopy of opaque materials depends on something beyond the mere availability and use of excellent optical systems, namely, the quality of the specimen surface preparation. Accordingly, she devoted her efforts, and still does, to producing surfaces which are worthy of the fine microscopes employed to study them.

An interest in the cutting and grinding of metals became a natural outgrowth of Miss Norton's work related to specimen surfacing. Thus she was well prepared to apply her knowledge and experience practically to a wartime project of developing, preparing, and calibrating standard sets of Ordnance finishes for inspection purposes. Currently, her attention is directed to the preparation of thin films and sections of metals and to the investigation of their properties.

Miss Norton has written numerous technical reports and has given talks to technical groups. She is the author and coauthor of many publications concerned with problems in physical metallurgy and with the production and evaluation of surface finishes.

The following technical society memberships reflect Miss Norton's scientific interests: American Institute of Mining, Metallurgical and Petroleum Engineers, American Society for Metals, American Society for Testing Materials (ASTM), Electron Microscope Society of America, Royal Microscopical Society (British), and the American Association for the Advancement of Science. She has represented the Ordnance Corps on ASTM Committee E–4, Metallography, since 1944, has been the Secretary of E–4 since 1946, and acts also as Chairman of Subcommittee II of E–4, on Definitions. Currently, she is serving a term as one of 13 Councillors for the New England District of ASTM.

Recognition of her efforts has been granted Mary Norton by these awards:

June 1945. *U.S. War Department Meritorious Civilian Service Award* for her wartime work associated with metallography and with the development of standards for Ordnance finishes.

June 1959. "American Society for Testing Materials Award of Merit," in recognition of constructive and consistent longtime efforts and leadership in the work of Committee E–4 on Metallurgy involving grain size and other standards, definitions, and editorial work.

25 AE–R&D Men Slated For Promotion to Colonel

Twenty-five participants in the Army Atomic Energy and Research and Development Specialists Programs have been recommended for promotion to the grade of Colonel. Their promotions will go into effect as vacancies occur in the programs.

Department of the Army Circular 624–36, dated Nov. 7, 1960, listed them as follows:

From within the primary zone, Nils M. Bengtson, George D. Carnahan, Wallace L. Clement, Armistead R. Harper, Joel M. Hollis, James N. Jean, Bruce B. Jones, Spencer P. Edwards, Jr., William F. LaHatte, William J. MacPherson, Howard W. Martens, Gregg L. McKee, John T. McKnight, Raymond W. Millican, William O. Morgan, Thomas H. Muller, Robert H. Offley, Jr., John R. Oswalt, Jr., Raymond I. Schnittke, Woodrow B. Sigley, Vallard C. Smith, Thomas E. Watson, Jr., and Dantee A. York.

From outside the primary zone, Paul R. Cerar and William D. Sydnor, Jr.

Those in the primary zone are officers who have been in the grade of Lieutenant Colonel since prior to June 30, 1951. Lt Cols Cerar and Sydnor attained their present grade subsequently.

Pfc Edward W. Mason, left, works on design of new stream-crossing equipment. Pfc Robert C. Mifflin operates an X-ray diffraction machine to determine qualitative and quantitative analysis of metal samples. They are among some 1,500 enlisted men with advanced education and experience who are proving valuable in the Army's Scientific and Engineering (S&E) Assistant's Program, which leads many into Army careers as officer or civilian scientists.

R&D Program Uses Enlisted Scientists

Complementing some 2,000 *officer* scientists and engineers currently engaged in Army research and development are 1,500 *enlisted men* whose qualifications, as established up to the time many were called into service from universities and colleges, are proving valuable in the Army's Scientific and Engineering (S&E) Assistant's Program.

Long before Sputnik I jolted America into realization of the need for developing and husbanding its reservoir of critical scientific skills, the United States Army initiated a program aimed at that purpose. That was 12 years ago, in 1948, when the Communist attempt to throttle free Berlin convinced the Nation that the Universal Peacetime Draft must continue for many years to come.

Since no population segment can be exempted from the military service obligation, the problem was how to enable young soldiers of advanced education and experience in vital vocations to continue progress while in service. The Army's original Scientific and Professional (S&P) Personnel Program, initiated in 1948, accomplished this purpose while greatly enriching Army research, development, testing and other technological projects. In May 1959, the initial concept was amended and renamed the Scientific and Engineering (S&E) Assistant's Program.

Currently, the S&E program is limited to enlisted personnel qualified for assignment in seven Military Occupational Specialties, including: MOS 309, Electrical-Electronic Engineering Assistant; 409, Mechanical Engineering Assistant; 509, Civil Engineering Assistant; 709, Mathematics-Statistics Assistant; 908, Physical Sciences Assistant; 909, Chemical Engineering Assistant, and 939, Biological Sciences Assistant.

Applicants must achieve a certain minimum score in the Army General Classification Test Battery. Possession of the necessary educational and experience qualifications does not automatically insure an S&E assignment. Such factors as adaptability, planning and decision-making ability, skill in written and oral expression, tact, emotional stability and supervisory capacity may also be considered.

The original S&P program based selection of personnel on college training in certain critical specialties. Army Regulation 611-211 published in May 1959 requires actual on-the-job experience.

"This change was prompted by the fact that some selectees needed so much training in service that their induction period was almost over before they could contribute to their projects," an Army personnel management official explained. "So the new program criteria require both advance college credit and a minimum period of on-the-job experience at the journeyman level."

The program is monitored at the installation or command level by S&E Advisory Groups made up of personnel officers, scientific officials and others qualified to evaluate all its phases. The Army stresses that S&E assignment does not exempt selectees from basic military duty and such company tasks as kitchen police, cleanup details and training exercises.

As soon as inductees or volunteers with scientific and educational qualifications arrive at induction centers they are classified. If potentially promising their names are reported to The Adjutant General. Basic requirements are a degree from an accredited college or university and six months of full-time work experience, civilian or military, in a scientific or engineering specialty, or 15 semester hours of graduate work.

Commanders are required to use scientific and engineering assistants in the positions for which they have been approved by The Adjutant General for classification in a scientific or engineering MOS. Commanders, however, may reserve the right of selection of personnel for certain key positions rather than have them filled automatically. In such cases the position

is filled by selection and reassignment from within the command.

Inasmuch as assignments made by The Adjutant General are based on written job descriptions and information concerning the individual, field commanders in some cases are permitted to make better assignments after observing performance on the job. Local reassignments which result in improved utilization or in a better distribution of personnel to accomplish the mission are encouraged.

Establishment of a Scientific and Engineering (S&E) Advisory Group at every installation utilizing 50 or more enlisted personnel classified in the Scientific and Engineering Assistant's Program is encouraged. If two installations in one command cannot meet the requirement of 50 EM individually, but together have more than 50, a single advisory board may serve them both.

One of the functions of S&E Advisory Groups, as stated in Army Regulation 611–211, is to maintain a "continuous evaluation of installation requirements for Enlisted Scientific and Engineering Assistants . . . to insure that installation requirements are changed to keep pace with continuously changing missions and project priorities. . . ."

Significance of the work of enlisted scientific and engineering assistants in responding to the Army's need for research and development, to meet current problems and cope with others projected far into the future, is well indicated by results at just one major installation—the U.S. Army Engineer Research and Development Laboratories (USAERDL), Fort Belvoir, Va.

Multiply the results at Fort Belvoir by results at similar installations throughout the seven Technical Services, as well as other R&D activities dispersed in many parts of the world, and the overall contribution of enlisted men to the Army's R&D successes becomes impressively meaningful.

For example, Robert Spitzka, a former ULCA student, during his USAERDL assignment, developed Army requirements for paints, varnishes and lacquers which were published as an Army standard. Later it was submitted for inclusion in a Department of Defense standard.

Don Tierney, who studied at Indiana Tech, while stationed at USAERDL prepared design drawings of a 10,000-gallon per hour Erdlater for treatment of water at a base in Greenland. Three units were used successfully there for more than two years.

USAERDL's Larry T. Gobble, a mechanical engineer from the University of Colorado, made what is believed to be the first application of remote control to construction of equipment when he designed and installed a radio system for the standard turnadozer.

Newman Craig, who learned his chemistry at Marshall (West Virginia) College, conceived and developed an analyzer that has served effectively in polar research. In three minutes his device, built at a cost of less than $100, measures the water content in snow-ice mixtures; it replaced an instrument that required 32 hours to give results and was impractical for field use.

Extensive studies that led to design of a new type dew-point analyzer for measuring the moisture content of high-pressure air used in missile systems earned recognition for Don Acheson, a former Harvard student. He also designed other equipment the Army has pressed into service.

USAERDL experience with soldier scientists and engineers is the basis of firm respect for their capabilities. In mapping technique improvements, in electronics, in development of bridging and stream-crossing equipment, in establishing better test procedures, in compiling highly technical requirements for a target location system used in guided missiles, in mine warfare devices—and in many other R&D areas—these scientist and engineer assistants have demonstrated their great potential for future progress.

Teamwork at all echelons utilizing the skills of the uniformed (officers and enlisted men) and the civilian scientists and engineers is a guiding principle of operations in the Army research and development program. Career opportunities for officers were pointed out in the first issue (December 1960) of the *Army Research and Development Newsmagazine* in an article on the Army R&D and Atomic Energy Programs.

Career opportunities for enlisted scientists and engineer assistants may follow a 2-forked road; they may lead to careers as Army R&D officers, or they may lead to the other half of the team—the civilian components upon which the success of the program, now and in the future, so vitally depends.

Medical Science Allied With Other Disciplines

Dependence of modern medical research upon alliance of the skills of doctors, surgeons and technicians with those of engineers, chemists, biologists and other specialists in the Life Sciences is pointed out realistically in an article in the Sept. 19 issue of *Product Engineering.*

The article emphasizes a trend in response to a need noted by Lt. Gen. Arthur G. Trudeau, Army Chief of Research and Development, in a speech to representatives of the Technical Services and other Army R&D activities who attended the Ninth Meeting of Army Key Scientists at Brooke Army Medical Center, Houston, Texas. He said:

". . . *Medical science no longer stands apart from other scientific disciplines. Each year medical research is being directed more and more to fundamental chemical, physical and mathematical approaches to the understanding of life. The requirement is ever increasing to blend knowledge of physical sciences together with that of the life sciences.*

"An example of this modern trend is the research in cybernetics, in which the neurophysiologist, the mathematician and the electrical engineer blend their talents. . . . Recent medical progress is being integrated with gains in the field of materials research. The result is replacement parts for bodies damaged by accident or in combat. New hope of establishing compatibility with life is thus being offered patients with major body defects. . . ."

The *Product Engineering* article, authored by Dora K. Merris, is titled "Medicine Consults the Design Engineer" and states, in part:

"Progress in designing easy-to-maintain, rugged but lightweight equipment has been achieved for the military by a design group at Fort Totten, N.Y. Under auspices of the Armed Services Medical Material Coordinating Committee and the immediate direction of Col. Raymond J. Karpen, this group of four mechanical, two electrical and two chemical engineers design equipment for service doctors in the field."

Army Demonstrates New Equipment for Joint Defense Group

Newly developed electronic devices enabling Army troops to move and fight effectively in pitch darkness without use of visible lights were dramatically demonstrated recently at Fort Storey, Va., before high-ranking Army, Navy, Marine Corps and Air Force officials.

Staged by the U.S. Army Transportation Training Command, the demonstration featured a 600-man buildup of both beach and air supply heads in which ships and aircraft were guided to night landings with infrared lights and signaling devices invisible to the naked eye. The see-in-the-dark equipment was developed by the Engineer Research and Development Laboratory, Fort Belvoir, Va.

Displayed in a daytime demonstration prior to the night operations were the recently developed LARC amphibian, the 330-foot long "General Page" discharge lighter, which is capable of transporting cargo from "roll-on-roll-off" ships at sea to beach supply points, a "flying crane" capable of carrying a 5-ton load, gas turbine helicopter which holds the world altitude record of 29,846 feet, rolling liquid transporters and other late devices for improving Army mobility.

Report Summarizes All GEM Research in U.S.

Comprehensive information on all known American research in ground effects machines (GEM) is contained in a forthcoming Army Research Office report.

Similar in scope to the 1959 ARO report on fuel cell research, the GEM report reflects the "tremendous interest" being shown by the Army, Navy and private industry in the phenomena that enable a vehicle to rise vertically from land or water on a column of air, and hover or be propelled forward.

Prepared by Mr. R. L. Ballard, aeronautical research engineer in the Physical Sciences Division, ARO, the report is now being coordinated and is expected to be ready for publication this month. Army and Navy programs in ground effects machines research are closely coordinated to avoid duplication of effort, the report emphasizes. Continuing cooperation among the military services and private industry also keeps researchers advised of progress.

Magnitude of private industry's participation is attested by information from more than 50 organizations engaged in programs varying from limited to extensive effort, including fabrication, research vehicles or experimental test facilities. Names of the more important concerns and a description of programs are given in the report.

The Army program, which is a responsibility of the Transportation Corps, has grown from allocation of $212,510 for Fiscal Year 1959 is almost 10 times that amount for Fiscal Year 1960.

The Navy program, supported partly by the Transportation Corps and the U.S. Marine Corps, is currently conducted by 28 contractors.

In conclusion, the report cites the consensus of the Army, Navy and private industry that further research must set the stage for development, and indicates the areas in which investigations should be pursued.

When published, the report will be made avaliable to the civilian scientific community by sale through the Office of Technical Services, U.S. Department of Commerce.

GEM (Ground Effects Machine) craft promises speedy, economical amphibian transportation in future. Air jets lift it above surface for forward progress.

AFQT Forms Culminate 3 Years of Research

New forms of the Armed Forces Qualification Test, designed to gauge whether a man is acceptable for military service in terms of his mental equipment or general learning and to predict the likelihood of his general effectiveness within the Army, became operational July 1, 1960.

Designated AFQT 7 and 8, and replacing forms 5b and 6b, the new forms culminated a 3-year research effort conducted by the Personnel Research Branch, R&D Division, The Adjutant General's Office.

Along with AFQT 7 and 8, auxiliary instruments used in connection with initial screening have also been introduced. Failure keys to detect deliberate failures on AFQT, or malingerers, were developed by the Personnel Research Branch by capitalizing on typical response differences between true and deliberate AFQT failures.

Periodically, the Department of Defense AFES Policy Board directs the preparation of new operational forms of the AFQT, used not only to reject men unqualified to succeed in the military services but to insure equitable distribution of available manpower among the services. Required research and development is undertaken usually by the Department of the Army as Executive Agency, with research assistance of the Departments of the Navy, Air Force, and Marine Corps.

Engineers Demonstrate Night Vision Equipment

Equipment that will give the modern Army greater nighttime maneuverability was shown to Lt Gen Arthur G. Trudeau, Chief of Research and Development, and other Army R&D personnel Nov. 22 by the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va.

The demonstration, conducted by personnel of the Warfare Vision and Far Infrared Branches of the Laboratories, included equipment recently type classified or undergoing tests.

Seven general areas were covered in the demonstration, including: battlefield illumination in which direct and indirect searchlights are used; long-range tripod-mounted viewers employing infrared and passive starlight viewers (low light image intensifiers); hand-held devices such as the infrared weapons sight; head-mounted night vision aids such as binoculars for driving; combat vehicle night vision aids such as the new infrared-visible tank kit; passive remote starlight viewers, similar to those used in television, and far infrared equipment including the thermograph.

FY 1961 Held Critical for GEM

The place of GEM (Ground Effects Machines) in the Army mission will be settled during this fiscal year, Maj Gen R. D. Meyer, Principal Assistant to the Chief of Transporation for Aviation, told the GEM Symposium held at Fort Myer, Va., Nov. 16–18.

Nearly 150 representatives of the U.S. Army Transportation Corps, the U.S. Navy and industry attended.

Col John H. Kerkering, Commanding Officer of the U.S. Army Polar Research and Development Center, Fort Belvoir, Va., from 1958 to 1960, has assumed the duties of Director of the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir.

Col Huber Heads ARO Life Sciences Division

Col. Tyron E. Huber, former Deputy Director of the Walter Reed Army Institute of Research, has assumed the duties of Chief, Life Sciences Division, Army Research Office, Arlington, Va.

A graduate of St. Louis University School of Medicine, Col. Huber has served with the Army since 1940. After a year at the Medical Field Service School, Carlisle, Pa., he became Executive Officer, Training Regiment, Medical Replacement Training Center, Camp Berkeley, Tex., 1941–42; Executive Officer, Medical Section, Camp Ellis, Ill., 1943; and Director of Training, Fort Lewis, Wash., 1944.

In 1945 he served with the Training Division, The Chief Surgeon's Office, European Theater of Operations, and later that year became Deputy Commander, Camp Seibert, Ala. His other assignments have been as follows: Medical Service, Brooke Army Hospital and Madigan Army Hospital, 1948–49; Chief, Medical Service and Deputy Commander, U.S. Army Hospital, Yokohama, Japan, 1949–52; Chief, Medical Research Branch, Research and Development Division, Office of The Surgeon General; Special Assistant to the Director, Walter Reed Army Institute of Research, Mar. 1958 to July 1958; and Deputy Director, WRAIR, from July 1958 to Nov. 15, 1960.

Col Tyron E. Huber

Army Studies Motivation

The Army has awarded a two-year contract to the Fels Group Dynamics Center, University of Delaware, for basic research to determine the motivating effect of a group on new members and how such effects vary as a function of characteristics of the group and new members.

Laboratory experiments conducted under the contract will include problem-solving tasks and group tasks where achievement depends on *esprit de corps*. Field experimentation will include studies of "open" vs. "closed" groups, correlates of conformity, optimal time to introduce a replacement into an understaffed group, and factors underlying assimilation of the newcomer into the group.

Dr. John T. Lanzetta, associated with the Center since 1956, will direct the research, assisted by Dr. Robert C. Ziller, a member of the organization since 1955. The Personnel Branch, R&D Division, The Adjutant General's Office, will monitor the project.

USASRDL Distributing Engineer Design Guide

Issuance of a project engineers design guide, prepared by personnel of the U.S. Army Signal Research and Development Laboratory, is scheduled this month.

The guide is intended to serve as an aid to project engineers within USASRDL as well as engineers in contractors' plants who are associated with military development of electronic equipment. Material for the guide is being furnished by USASRDL engineers and scientists who are best qualified in their fields.

Valuable contributions to the guide have been made also by the U.S. Army Signal Materiel Support Agency at Fort Monmouth, N.J., and the U.S. Army Signal Supply Agency, Philadelphia, Pa.

Prepared in loose-leaf format, suitable for insertion of future revisions and additions, the guide will consist of approximately 20 chapters on such subjects as reliability, human factors, technical literature, mechanical design, maintenance, packaging, mobility, components, materials, electron tubes, power sources, and other helpful information.

ERO Service Wins Award

Outstanding service as Chief of the Basic Science Division of the U.S. Army Research and Development Liaison Group (European Research Office), Frankfurt, Germany, earned Lt. Col. George Metcalfe a Certificate of Achievement presented recently by Col. George F. Moynahan, Director, Combat Developments, U.S. Army Electronic Proving Ground (USAEPG), Fort Huachuca, Ariz. Col. Metcalfe is now executive officer, Plans Division, Directorate, Combat Developments, USAEPG.

Ordnance Corps Testing More Durable Lubricant

A resin-bonded dry film lubricant, which tests indicate has a wear life twice as long as that of the best commercial product available, has been developed by the U.S. Army Ordnance Corps Rock Island (Ill.) Arsenal Laboratory.

RIA Compound 9A consists of epoxy and phenolic resins, colored with lubricative pigments, and thinned to a proper consistency with Doxane. It is said to be particularly effective in mechanisms that must be lubricated for life.

In field tests the lubricant was applied to components of the XM34 Little John rocket launcher, and results showed it is satisfactory through it does not provide protection against corrosion. Research is underway to correct this deficiency.

Conducts Training Research

Dr. Francis H. Thomas, Senior Scientist, U.S. Army Aviation Human Research Unit, Fort Rucker, Alabama, is working toward improved methods for training human aerial observers in target detection and related skills.

Device May Speed Up Contouring of Air Photographs

Automation of the present time-consuming task of contouring aerial photographs is promised by an automatic mapping instrument now under test by the U.S. Army Engineer Geodesy, Intelligence and Mapping Research and Development Agency, Fort Belvoir, Va.

Called the "Stereomat," the instrument employs photo-electric cell "flying spot" random scanning and other electronic techniques which enable faster processing of data. It is expected to contour a pair of aerial photographs faster than a person can, with equal accuracy.

A faster data processing system is badly needed, as is shown by the fact that enough photographs can be taken from a single aircraft in one day to keep a manually operated photogrammetric plotting machine busy for an entire year.

The Stereomat is a development of Hunting Associates, Ltd., of Canada. The unit undergoing test by the Agency at Fort Belvoir is the first in the United States.

AOMC Chief Envisions Troops Riding Missiles

Troops of the future may ride to battle in ballistic missiles and the airplane may have a short life as a weapons system, Maj. Gen. John A. Barclay, Deputy Commanding General of the Army Ordnance Missile Command (AOMC), suggested recently before the Missile and Astronautics Division of the American Ordnance Association in Cleveland, Ohio.

"In addition to the easily demonstrated use of missiles for selective application of measured force in terms of destruction," General Barclay said, "the time has come to consider them as the most effective delivery system which may be predicted."

Concentration of firepower and shorter range weapons on the battlefield and super-fast reinforcement of positions with manpower and material are delivery roles envisioned for ballistics missiles of the future.

"Through use of missiles as an accurate delivery system, fully and directly responsive to the will of the ground commander, the Army knows that it can provide firepower and selective force immediately at those critical points where concentration will impose effective control," General Barclay said.

Commenting on the airplane's future, he said, "Since the airplane operates within the earth's atmosphere, it bids fair to have the shortest total life as an effective weapon system in war as any that history has produced."

Army Library Announces Missile Bibliographies

Since 1956 research analysts of the Army Library, The Adjutant General's Office, have produced periodically a series of bibliographic studies on guided missiles, rockets, satellites and space exploration, covering the technological, organizational, and doctrinal aspects.

Usage of this series had grown to such an extent by 1958 that the Office of the Chief of Research and Development requested all subsequent issues of these studies to be published as Department of the Army Pamphlets. In June 1958 the following DA Pamphlets on Missiles, Rockets, and Satellites were published: 70–5–1 USSR; 70–5–2 United States; 70–5–3 Great Britain, France, and Other Free Countries of the World; 70–5–4 Technology: Means and Methods; 70–5–5 Earth Satellites and Space Exploration.

In August 1959 the Department of the Army issued DA Pamphlet 70–5–6, Missiles, Rockets in War and Peace, and in August 1960, DA Pamphlet 70–5–7, Missiles, Rockets and Space Vehicles, 1959–1960.

DA Pamphlet 70–5–8, USSR: Missiles, Rockets and Space Effort, a Bibliographic Record, 1956–1960, is now being distributed.

These DA Pamphlets attempt to be thorough in their coverage and are probably the only concentrated sources of unclassified data in this field. Titles in the bibliographies are accompanied by abstracts which describe the content of the paper to save the reader the time that must be expended in culling for a particular publication or document.

Examination of a sample of these pamphlets shows the following coverage: defense and preparedness; Army, Navy, and Air Force missiles and rockets by type; installations and ranges; training activities; space exploration programs; technology (including design and development, ground support, orbits and orbiting, etc.); interplanetary flight; source materials; etc.

The bibliographies are available through regular Army distribution channels.

Nuclear Power Planned for Overland Train

Joint effort by the Atomic Energy Commission and the Army Corps of Engineers directed toward development of a compact, portable nuclear power plant, suitable for many military requirements, is expected to yield a preliminary design for a prototype by the spring of 1961.

When initiated in May 1960, the project was aimed at development of a prototype plant in approximately one year, but an AEC spokesman indicated recently that the original estimate may have to be revised. Design specifications call for a plant with a rating of 2,000 to 3,000 kilowatts.

One of the promising potential applications of the plant is to provide power for the Army's new Overland Train, now under construction by R. G. LeTourneau, Inc. When available, nuclear power is expected to give the train almost unlimited cruising range.

Designed to serve as a mass transportation vehicle with an off-road capability not available presently in other Army equipment, the train will consist of a lead car, 10 or more cargo cars, and two power plants. Estimated cargo capacity with 10 cars is 250 tons. Each of the 54 wheels, 10 feet high, will be driven by an electrical motor. The overall length of 560 feet is almost as long as two football fields.

Dynamometer Vehicle Aids Scale Model Field Tests

Economies in the research and development process through use of scale models for testing are ably demonstrated with the Army's new all-terrain dynamometer vehicle.

Built by the firm of Wilson-Nuttall-Raimond Engineers, Inc., at Chestertown, Md., where it was unveiled in a formal ceremony on Oct. 15, the new experimental vehicle was produced under contract with the U.S. Army Transportation Research Command (USATRECOM), Fort Eustis, Va.

Predictions on performance of full-size vehicles usually can be reliably based on experiments using scale models, said Col. John D. Crowley, Jr., USATRECOM Commanding Officer. USATRECOM is carrying on a broadening program utilizing scale model vehicles in varying terrain tests.

The all-terrain dynamometer vehicle is designed to eliminate one of the time-consuming and costly processes formerly involved in testing—the necessity of moving delicate instruments from one test vehicle to another for changing conditions of terrain.

USAR R&D Units Provide Standby Strength

Often termed the "strength in depth" of Army research and development, more than 1,700 participants in the Army Reserve R&D Unit Program are providing a nucleus of trained scientists and engineers ready for duty in event of a national emergency or declaration of war.

The program provides an organized means to train and develop reserve scientists and engineers, keeps them abreast of military technological developments within the Army, and utilizes their talents in peacetime to enhance the Army research and development mission. Overall responsibility for the program is vested in the Chief of Research and Development, Department of the Army.

Participating in the program are 74 units, each composed of 10 to 77 members, located in 32 states. Members are representative of various ranks, branches and professional fields; in general they are influential in the civilian scientific community and are eager to serve the Army in a dual role as military-civilian scientists and engineers.

For example, the 1131st R&D Unit of Ithaca, N.Y., is composed of 19 members, most of them associated with Cornell University. The 3369th R&D Unit of Birmingham, Ala., has 24 members who represent a cross section of professional fields. Most of the 57 members of the 3353rd R&D Unit at Redstone, Ala., are engaged in rocket and guided missiles development.

Only personnel qualified by education and experience to perform professional scientific and engineering work in specified fields may be assigned or attached to an Army Reserve R&D Unit. Final approval of applicants is determined at Department of the Army level. Generally, education and experience in the fields of physical, engineering, medical and biological sciences, including pertinent fields of psychology and mathematics, are needed to qualify.

Procedures for organization of USAR R&D Units, qualifications for members and other pertinent information are set forth in SR 140–190–2 and AR 140–305. The SR is being incorporated in a forthcoming revision of AR 140–305.

Members of USAR R&D Units maintain an affiliation with the Army Reserve and Active Army by a combination of Active duty training (ACDUTRA) and Reserve duty training. Within the broad guidelines established by the Office of the Chief of Research and Development (OCRD), each unit develops its own Reserve duty training programs based upon its size, qualifications, interests, experience of members, and available facilities. Programs include periodic training assemblies and individual, group or unit efforts on research projects. R&D Film Reports, newsletters and other materials apprise members of current R&D activities.

Subject to availability of funds, individual members of R&D Units may perform ACDUTRA with Army R&D agencies, U.S. Continental Army Command (USCONARC), ZI Armies, the Technical Services, or by attendance at approved seminars, and conference. Members have performed ACDUTRA at the Army Medical Research and Nutrition Laboratory, Denver, Colo.; Biological Warfare Laboratory, Fort Detrick, Md.; Ordnance Guided Missile School, Huntsville, Ala.; Army Chemical Corps School, Fort McClellan, Ala.; and at many other activities.

In August, 85 R&D Reservists attended the Third U.S. Army Seminar in Nuclear Sciences at Oak Ridge, Tenn., sponsored by the 3252nd R&D Unit. Some 50 reservists attended the 1960 seminar sponsored by the Engineer Research and Development Laboratories' Mob Des Det #39 at Fort Belvoir, Va. Other conferences and seminars, such as the Signal Corps Seminar at Fort Monmouth, N.J., and various Navy seminars, have been available to reservists.

As part of their training, R&D Reservists may pursue research projects assigned to their unit. Most projects are undertaken by individuals, some by groups of individuals with similar interests and capabilities, and others by the entire unit. For example, Maj Adolph Roth of the 6161st R&D Unit developed a complete bibliography on Arctic Insects; Lt Cols Walter Sylvester and Francis Reilly of the 1349th R&D Unit collaborated on a Survey of Methods for Pretreating Steel, Aluminum, and Magnesium. The entire membership of the 3353rd USAR R&D Unit set up and continues to develop and maintain the museum at Redstone Arsenal; it also maintains a history of rockets and guided missiles.

Project assignments have a twofold purpose: to develop technical knowledge of participants; to contribute to the Army R&D mission. Retirement point credits for work performed on assigned projects are prorated on the same hourly basis as credits for attendance at training assemblies. A Project Guide is furnished from which projects may be selected; however, most ideas for projects emanate from unit members. Association of ideas, military experiences, civilian experiences, and knowledge of technological advances all help to generate ideas for which project assignments are requested.

Project assignments are usually related to or associated with the reservists' specialized skills. Work on projects normally produces valuable data, and by expanding their knowledge in a specific field researchers help themselves, possibly their employers, and the Department of the Army.

ODD(R&E) Plans MENEX Bulletin

Interchange of maintenance information is the purpose of a semiannual MENEX Bulletin, the first issue of which is scheduled for distribution this month, the Office of the Director of Defense Research and Engineering has announced.

The Bulletin will comprise information furnished by participating governmental and private agencies. Contributors will furnish the Office of the Director of Defense Research and Engineering with a listing of their maintenance reports, a copy of the reports, and an unclassified abstract, 150 words or less, of each report.

The Bulletin will be supplied to contributing organizations. Reports listed in the Bulletin will normally be available through the Armed Services Technical Information Agency (ASTIA) or the originator.

Report subjects will include: Maintainability, Specifying Maintainability, Measuring Maintainability, Maintenance Engineering, Maintenance Implications, Maintainability Design Guides, and relationships between maintainability and factors such as cost, performance and reliability.

Industrial, educational, research and DOD agencies desiring to participate are advised to contact the Office of Maintenance Engineering, Office of Director of Defense and Engineering, Washington 25, D.C.

New Executive Officer

Lt. Col. Howard C. Aylesworth is the new executive officer of the U.S. Army Chemical Research and Development Laboratories, Army Chemical Center.

Formerly assistant director of instruction at the Chemical Corps School at Fort McClellan, Ala., Col. Aylesworth is a native of Corvallis, Oreg. He has a B.S. degree in Education from Oregon State College and an M.A. degree in Education from the University of Virginia.

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LARC 5s are demonstrating versatility as cargo transports on water and land, particularly over rough terrain. Lower model is first with gas-turbine engine.

LARC Hailed for Project Mercury Aid

A little-known but vital phase of Project Mercury has brought new laurels to the LARC (Lighter, Amphibious, Resupply, Cargo) project group at the U.S. Army Transportation Research Command at Fort Eustis, Va.

Participating under the civilian supervision of the National Aeronautic and Space Administration and operating at an Air Force base in conjunction with Marine Corps helicopters, this new Army amphibian has also helped to demonstrate effective inter-service cooperation. Project Mercury is NASA's initial manned space flight program.

Developed by the Army Transportation Research Command and constructed of aluminum, the LARC comes in 5- and 15-ton sizes. In September one 15-ton and two 5-ton LARC's and their crews were dispatched to Patrick Air Force Base, Fla., for training in the recovery of errant nose capsules, dummy or real, that might fall in "shoots" scheduled at Cape Canaveral.

Thus far, their success in this mission has been outstanding. Don Cheatham, assistant head of the recovery operations branch of the space task group at NASA headquarters, Langley Air Force Base, Va., said the LARCS's have done a "tremendous" job. "Their capability," he added, "to negotiate the rugged terrain down there and their ability to recover practice capsules under almost any conditions is amazing."

Operating daily in the ocean, in marshlands, and over terrain covered with scrub palmetto trees, these massive amphibians move with equal versatility on land or water.

Army Tests BMEWS Shield Effectiveness

Findings in tests conducted during the past year by a USASRDL team to determine effectiveness of the electromagnetic shielding methods used for the BMEWS (Ballistic Missile Early Warning System) sites will soon be disclosed in a Technical Report of the mission.

A preliminary report was given recently by Mr. Bruno Rippke, USASRDL expert in radio interference reduction, in a briefing of Corps of Engineers, Air Force and contractor personnel following his observation of the final tests at Thule, Greenland. Similar tests are being made at the BMEWS site in Clear, Alaska, and at various rear communications sites by a USASRDL team headed by Mr. John J. O'Neil.

Shielding of certain buildings at BMEWS sites is necessary for compatibility between the various electronic devices which make up the BMEWS system and to prevent personnel injury by R.F. radiation from transmitters.

Reserves Take Part In Translating Task

Capabilities of U.S. Army Reserve Research and Development Units in translation of foreign language scientific and technical material will be utilized under a new program which provides for retirement credits.

Initiated in mid-November by direction of the Chief of Research and Development, Lt Gen Arthur G. Trudeau, the "R&D Translation Project" is outlined in the recently published Supplement No. 2 to the Project Guide for USAR Units.

Aware of the proficiency of many R&D Reservists in foreign languages and of a considerable backlog of untranslated scientific material, General Trudeau regards the new program as a means of increasing their fluency and improving their knowledge of foreign scientific achievements. While benefiting themselves thus, and also earning retirement credits, Reservists will be helping to solve the Army's problem of broadening its base of knowledge regarding foreign research.

Reservists interested in taking part in the program must have the scientific or technical background to understand what they are translating. The new Reserve Regulation, AR 140-305, simplifies the procedure for assignment of projects in the translation program. R&D Reservists may request assignment by letter through their Unit Commander directly to the Office of the Chief of Research and Development.

Letter requests must contain information indicating the language and degree of proficiency and the scientific or technical field in which the individual(s) is most knowledgeable. Material to be translated will be forwarded directly to the Army Corps which in turn assigns the project to the unit.

Last June a similar plan was published for Army R&D Reservists to help in the development of an antiradiation drug to provide protection from harmful radiation effects when taken prior to exposure. That program calls upon the skills of chemists, biologists, bacteriologists, physiologists, pharmacologists, pathologists, gynecologists, hematologists and virologists.

Officer Returns to Old Job

Back for a second tour of duty as Deputy Commander of the U.S. Army Chemical R&D Laboratories, Army Chemical Center, Md., is Lt. Col. Allan C. Hamilton, who filled the position in 1956–1958. He is also a former Commanding Officer of Edgewood Arsenal.

Field Army Ballistic Missile Defense Studied

Seeking a Field Army Ballistic Missile Defense System, the Department of the Army recently awarded six contracts totaling $3 million to industrial teams for feasibility studies to be submitted within nine months.

The action followed months of comprehensive analysis by an Army-wide team which evaluated 17 study proposals submitted by 30 contractors in a variety of project team groupings. Research and Development Operations, Army Rocket and Guided Missile Agency (ARGMA), an element of the Army Ordnance Missile Command, Huntsville, Ala., coordinated activities of the team.

Maj Gen August Schomburg, Commanding General, Army Ordnance Missile Command, said results of the feasibility studies will be evaluated to determine a further course of action. ARGMA is also supervising the Army-industry team currently engaged in the Nike Zeus project, the only anti-missile system now under active development.

Nike Zeus, however, is designed for employment at fixed sites to protect such important targets as cities, industrial centers and defense installations from attack by intercontinental and intermediate-range ballistic missiles.

The proposed Field Army Ballistic Missile Defense System has different requirements since it must be capable of moving with the Army in the field and defending it against a variety of missiles that might be used on the battlefield.

First Army weapon with aluminum barrel, new grenade launcher will give infantryman an area fire capability between maximum grenade and minimum mortar ranges. A soldier could shoot around a corner by aiming at wall on far side of a street at an angle; resultant richochet of grenade would land it for explosion.

Feasibility study awards of $250,000 each have been made to the following industrial contractor teams to expand proposals submitted to the Department of the Army several months ago:

Convair, Poma, Calif., with Burroughs Great Valley Laboratory of Paoli, Pa., and Westinghouse Air Arm Division of Baltimore, Md.

General Electric Co., Radnor, Pa., with Chrysler, Detroit.

Hughes Aircraft Co., Fullerton, Calif., with North American Aviation of Downey, Calif.; Aerojet General Nucleonics of San Ramon, Calif., and R. G. Le Tourneau of Longview, Texas.

The Martin Co., Orlando, Fla., with the W. L. Maxson Co. of New York.

Raytheon, Bedford, Mass., with International Business Machines Corp. of Bethesda, Md.; Dunlap and Associates, Inc., of Stamford, Conn.; AVCO of Wilmington, Del., and Northrop Corp. of Hawthorne, Calif.

Sylvania, Waltham, Mass., with Aeronutronics of Newport Beach, Calif.

Signal Corps Gathering Data Desired by QMC

Responsible for operational meteorological support to all Army research and development activities around the world, the U.S. Army Electronic Proving Ground, Fort Huachuca, Ariz., is preparing for a special radiation study on the slopes of Mauna Loa, the 13,000-foot volcano on the island of Hawaii.

This study will employ a new type pyrheliometer, an instrument which will measure the sun's radiant energy by predetermined wave-length bands. The data will be gathered for the U.S. Army Quartermaster Corps in support of its studies of world environments as they affect the comfort, health, and efficiency of the American fighting man.

Deterioration by solar radiation is an extremely important factor controlling the design of clothing, shelter, and storage of supplies and weapons of warfare. It has long been suspected that the sun's radiation, especially in the short-wave bands, has a deteriorating effect which shortens the useful life of both organic and synthetic fabrics.

The Hawaii project is expected to result in a better understanding of the mechanisms of deterioration. Meteorological data will be taken for an 18-month period beginning early in 1961.

The U.S. Weather Bureau, which operates the meteorological observatories at both Hilo and near the summit of Mauna Loa, also is cooperating with the U.S. Army Quartermaster Research and Engineering Command.

New Malaria Pill Slated For Field Test in Korea

Troops in Korea will soon be taking a new unnamed pill that promises to be the most effective treatment yet developed for control of malaria. Personnel in infected areas will receive one tablet a week for malaria treatment.

Studies conducted by Dr. Alf S. Alving, University of Chicago, supported by the U.S. Army Medical Research and Development Command, have produced a tablet combining chloroquine and primaquine, both developed since World War II to replace atabrine and quinine which often caused unpleasant side effects.

Recent treatment required a weekly dose of chloroquine to quiet malarial symptoms. Chloroquine serves only as a suppressant, however, and malaria parasites are known to dwell for years in the liver and other tissues, causing recurrence of the disease.

Premaquine came into use in 1951 as a permanent cure. Under supervision of medical officers, the drug was administered daily to troops during their last two weeks in infected areas or while they were enroute to the U.S. in ships.

The combined suppressive-preventive tablet was developed to simplify treatment, and is being field tested in Korea where malaria is a major problem.

Ordnance Offers Course On Design and Analysis

The Ordnance Corps will present its 3-week course on "Design and Analysis of Experiments" to a class at the Ordnance Management Engineering Training Agency (OMETA), Ordnance Weapons Command, Rock Island, Ill., beginning Jan. 30.

The course was developed by the Corps to assist Research and Development personnel to accomplish scientific experimentation economically and effectively. It is given periodically as required, according to interest evinced by enrollment requests.

Probability, descriptive statistics, estimation and hypothesis testing are the statistical inference concepts constituting the introduction to experimental design and analysis. Experimentation, experimental design concepts and analysis of experimental results comprise the concluding half of the course. Representative topics include Randomized Blocks, Latin Squares, Factorials, Sequential and Regression Analysis.

Further information about the course content and spaces in future classes may be obtained upon request from: Commanding General, Ordnance Weapons Command, Rock Island Arsenal—Attention: Director, OMETA.

Nation's Experts Exchange Viewpoints At "Man Living in the Arctic" Parley

A score of men whose combined scientific knowledge of human living requirements in the Arctic is perhaps unsurpassed participated in a conference on the subject Dec. 1 and 2 at the Quartermaster Research & Engineering Command, Natick, Mass.

Sponsors of the "Conference on Man Living in the Arctic" were the National Academy of Sciences-National Research Council Advisory Board on Quartermaster Research and Development, The Arctic Institute of North America and the U.S. Army Quartermaster Corps.

The 2-day symposium reviewed accomplishments of the military services in extending military and civilian capabilities for living in cold climate regions through research in clothing, food and shelter, examined new scientific avenues leading toward increasing those capabilities, and discussed possible future living requirements for the Arctic.

Participants included Brig Gen Merrill L. Tribe, Commanding General, Quartermaster Research and Engineering (QM R&E) Command; Lt Gen Arthur G. Trudeau, Chief of Research and Development, and Maj Gen A. T. McNamara, The Quartermaster General, Department of the Army; Dr. Paul A. Siple, Scientific Advisor, Army Research Office (ARO); Dr. H. T. Hammel, Department of Physiology, University of Pennsylvania;

Dr. John C. Reed, Executive Director, The Arctic Institute of North America; Dr. Harwood Belding, Professor of Environmental Physiology, University of Pittsburgh; Dr. J. S. Kennedy, Research Director, Textile, Clothing and Footwear Division, Dr. Austin Henschel, Research Director, Environmental Protection Research Division (EPRD), and Dr. W. Robison, Regional Environments Research Branch (EPRD), all three of QM R&E Command;

Dr. Carl R. Eklund, Chief, Polar Branch, ARO; Col Joseph Blair, Army Medical Corps; Dr. O. Edholm, National Institute for Medical Research, London, England; Dr. John P. Meehan, Department of Physiology, Kerckhoff Laboratories, Los Angeles; Dr. David Rioch, Chief, Division of Neuro-Psychology, Walter Reed Army Institute of Research;

Dr. Steven M. Horvath, Head, Physiology Department, Division of Research, Lankenau Hospital, Philadelphia; Dr. Walter Wood, President, American Geographical Society, New York City; Mr. Paul Queneau, Vice President, International Nickel Co., New York City; Mr. Trevor Lloyd, Department of Geography, McGill University, Montreal, Canada; and Dr. George W. Rogers, Consultant, Juneau, Alaska.

During the program General McNamara dedicated the Arctic Environmental Test Chamber at Natick to Sir Hubert Wilkins, renowned Arctic explorer, who served as consultant and geographer for the U.S. Army Quartermaster Corps from 1942 until his death in 1958. The program also included a dinner in honor of American pioneers of arctic exploration.

Armed Forces Board Meets On Epidemiology Problems

The Armed Forces Epidemiological Board, which convenes twice a year to advise the military medical services on matters of epidemiological research and preventive medicine, held its fall meeting Dec. 6 at the Walter Reed Army Institute of Research, Washington, D.C.

Nine Central Board members, headed by Dr. Gustave J. Dammin, professor of pathology at Harvard Medical School and president of the AFEB, discussed Board and Commission organization, policies and future requirements.

Representatives of the military medical services, National Research Council, Public Health Service, Office of the Assistant Secretary of Defense (Health & Medical), Office of Civil Defense Mobilization, Army Environmental Hygiene Agency, and the Walter Reed Army Institute of Research attended an open session.

TC Puts Mohawk Plane Through Rigid Testing

Stepped-up testing of the Army's new tactical observation aircraft, the AO-1-AF Mohawk, will begin this month and continue into the early spring, the U.S. Army Transportation Materiel Command has announced.

In mid-January, a Mohawk will undergo combined specification compliance evaluation and user tests in the main chamber of the Climatic Projects Laboratory, Eglin AFB, Fla. Included will be "soak" tests in which the plane will be subjected to temperatures ranging between 70 degrees above zero and minus 65 degrees F.

The test program for the twin turboprop-powered aircraft was launched in October. The Army Aviation Board began service testing of two Mohawks at Fort Rucker, Ala. At the same time, two other Mohawks started logistical tests that will carry into early spring under the Army Transportation Aircraft Test Activity, also at Camp Rucker.

The logistical program will subject the aircraft to 1,000 hours of flight stress to approximate the normal strain of several years operation. TC authorities then can estimate durability of various parts and project the quantity of each needed for operational stocks.

Mohawk development responsibility rests with the Navy's Bureau of Weapons (BUWEPS) but ATMC is charged with the technical compliance testing program and furnishes the test director and other engineering personnel. The operations officer and the crew that flies the shakedown and ferry flights are provided by the Army Aviation Board.

Yuma Test Station Discredits Heat Theory

Intent on finding ways to reduce the heat load of soldiers clad in chemical-proof clothing, Army scientists have disproved common beliefs about the heat of the noonday sun. They found that it is really "hotter" in the morning and evening.

Reporting on recent experiments in the desert at Yuma Test Station, Ariz., Dr. A. A. Woodward, Mr. W. Blevins and Mr. C. M. Greenland, all employed at the U.S. Army Chemical Center (Md.) Research and Development Laboratories, submitted these conclusions:

1. The intensity of solar radiation is nearly uniform during daylight hours, quickly reaches a near maximum in early morning and increases only about 4 percent in mid-afternoon.

2. During the "hottest part of the day"—from noon to early afternoon—a standing person actually receives less solar radiation than he does earlier and later in the day.

3. The direct sun rays are about eight times as intense in the desert as the total indirect, or "diffuse" radiation.

4. Heat load varies widely with weather conditions, land features, physical characteristics of the clothing, and the position of the individual in relation to his surroundings.

5. A person lying on the ground will receive considerably more solar radiation, but almost no "diffuse" radiation.

Popular notions about the noonday sun will probably persist because people "feel" heat rather than radiation.

Antarctic Bird Migrations May Yield Information on Contagious Diseases

Dr. Carl Eklund substituting egg with electronic temperature telemeter inside it for one of two natural Adelie penguin eggs at Wilkes Station, Antarctica.

If you want to learn about the fascinating subject of bird banding in the Antarctic, Dr. Carl R. Eklund of the Army Research Office (ARO) Environmental Sciences Division is the man to consult.

As International Geophysical Year (IGY) Chief Scientist at Wilkes Station, Antarctica, 1956–1958, Dr. Eklund pioneered bird migration studies that may help control the international spread of contagious diseases and lead to other beneficial results.

The National Science Foundation (NSF) considers the studies sufficiently promising to support their continuation with a Grant-in-Aid of $23,000.

"I'm a little wary about discussing that grant money," the scientist said. "People might think that I'm drawing two salaries or something."

Actually, Dr. Eklund explained, the grant is administered through The Johns Hopkins University and is used to buy experimental equipment and to pay the salary of an analyst who collates current banding data.

Dr. Eklund's project is based on the probability that birds carry diseases between far-flung geographical areas and may even disseminate plant life, malevolent and beneficial, through their intercontinental migrations. His technique is simple in concept but difficult of execution, especially in that part of Antarctica where temperatures sometimes plunge to 60 degrees below zero.

Certain ground areas are baited with tasty morsels, such as seal meat. Then 60 by 30-foot nets are fired from a battery of three electrically activated cannon at ranges up to 40 yards into the feeding areas where the birds are trapped, sometimes more than 50 in a catch. The final step is the snapping of numbered aluminum bands onto the legs of the threshing, biting, scratching creatures—no task for softies.

"We had to work bare-handed in those sub-zero temperatures," Dr. Eklund recalled, "and birds have sharp beaks and talons. So at the end of the day, our hands and faces were usually pretty well marked up."

Attracted by the bright metal markers, ornithologists—and sometimes laymen—in other lands trap the traveling birds and send them on their way again. The numbers and other information are forwarded to the U.S. Fish and Wild Life Service in Washington, D.C., which checks them against those recorded by the bird banders and thus traces the migrations.

Study targets included the Skua bird which never willingly leaves the Antarctic, lives mainly on marine life, young penguins and penguin eggs, and has been known to fly within 90 miles of the South Pole. Another study specimen is the Giant Fulmer bird, which boasts a wing span up to 82 inches and tips the beam at 10 to 12 pounds. It sometimes feeds off the dead and has been known to attack live human beings. After the British-German naval Battle of the Falkland Islands, during World War I, Fulmers were seen diving at sailors in the sea.

Through banding trace, it was proved recently that one Fulmer circled the globe twice in a single year, touching down on several continents. Analysis of the Fulmer's alimentary tract may indicate its disease-carrying potentiality. Fulmers are also tough to band. "They spit and vomit at you," Dr. Eklund explained, "and to say that this is an unpleasant experience is a prime understatement."

A native of Tomahawk, Wis., Dr. Eklund received his B.S. degree from Carleton College, Minn., in 1932, his M.A. degree from Oregon State College in 1938 and his Ph. D. from the University of Maryland in 1958. For 20 years, he was employed by the U.S. Fish and Wild Life Service, an agency of the Department of the Interior which administered Admiral Byrd's Antarctic expedition of 1931–1941. Dr. Eklund was assigned to the enterprise as a biologist and thus began his distinguished polar career. In 1956, the National Academy of Sciences chose him as IGY Chief Scientist for Wilkes Station. Upon completion of this assignment, in July 1958, he accepted his present employment with ARO.

During the IGY program, Dr. Eklund also initiated bird incubation studies in which he pioneered a technique that defies the conclusion of that old "Humpty-Dumpty" nursery rhyme.

Skua and penquin eggs were bisected and emptied and minuscule telemetric devices were inserted in the shells. These were then refilled with albumin, cemented together again and placed in nests with normal eggs. Ingenious overhead loop antennas, devised by Dr. Eklund, relayed pulse rates to a radio receiver located in a nearby shelter. The pulse rates reflected changes of temperature in the incubating eggs. Through this method, Dr. Eklund and colleagues found some indication that the waddling, earthbound Adelie Penguins incubate at temperatures lower than those of other birds.

If the lower temperatures can be confirmed, Dr. Eklund explained, the next step will be to determine exactly what element in the bird's makeup causes this phenomenon. *"It is at this point that the work may take a turn that will benefit man," he concluded, "for the findings could have important medical applications, notably in the field of anesthesia."*

$25 Million Fort Detrick Station Links East Coast With STARCOM Network

The world's largest automatic communications relay station, capable of handling 275,000 messages a day, began operations last month at Fort Detrick, Md., home of the Chemical Corps Biological Research Laboratories.

Designated the East Coast Relay Station, the $25 million installation is the control station for the Strategic Army Communications System (STARCOM), the Army's worldwide network. With the Midwest Relay Station at Fort Leavenworth, Kans., and the West Coast Relay Station at Davis, Calif., the East Coast Relay Station completes the STARCOM network in the U.S.

The Fort Detrick station is the only one of the three U.S. stations that sends and receives messages by troposcatter —a means of caroming signals off atmospheric layers high above the earth— which reduces atmospheric interference. A troposcatter system links the station to the Army's overseas radio receiving station at La Plata, Md., and, via microwave radio, to the transmitting site at Woodbridge, Va.

Operated by the Army Signal Corps, the station represents the most modern approach to the worldwide communications needs of U.S. combat and peacetime forces here and abroad. Besides its ability to handle more than a quarter of a mililon words daily, the station can store 5,000 messages. For high-speed, automatic handling these are transferred to punch tape; at their destinations the messages are converted back to printed form.

A typical message can be sent through the station's automatic switching center in three minutes and its receipt at another station around the world begins before the end of the message has been transmitted. The station also uses landlines and microwave radio.

The advanced capabilities of the installation are the product of an Army-Industry team. Cooperating with the Army Signal Corps, the Automatic Electric Company of Northlake, Ill., provided the extensive automatic switching facilities and the Kleinschmidt Division of Smith-Corone-Marchand, Deerfield, Ill., produced the teletypewriters and associated units. Collins Radio Co., Cedar Rapids, Iowa, developed the troposcatter radio systems which were installed by its Dallas, Tex., division.

400 Attend Redstone Meet On Missiles Value Analysis

More than 400 top management representatives from the Army and industry attended the Army's first Value Analysis-Engineering Seminar for missile systems, held at Redstone Arsenal, Ala., Nov. 29–30 under the joint sponsorship of the Army Ballistic Missile Agency and the Martin Company.

Essence of the Value Analysis-Engineering technique is to determine whether a missile part can be simplified and produced at less cost, or eliminated, without sacrificing the quantity of performance of the part or the missile.

GIMRADA Established By Corps of Engineers

To provide the Armed Forces with more accurate and faster equipment in the fields of geodesy, intelligence and mapping the Army Corps of Engineers has established a new agency, the Geodesy, Intelligence and Mapping Research and Development Agency (GIMRADA), at Fort Belvoir, Va.

Headed by Col Leonard L. Haseman, GIMRADA will assume all research and development functions of the Army Map Service and Engineer Research and Development Laboratories' Topographic Department, including the letting of contracts to outside agencies.

SC Develops Antenna Telescoped From 150 To 23 Feet on Truck

A 150-foot stainless steel antenna mast that can be collapsed to a length of 22 feet 9 inches for truck transport has been developed by the U.S. Army Signal Research and Development Laboratory, Fort Monmouth, N.J.

When erected, the mast can safely outride winds of 100 miles an hour and can support in a 50-mile gale antennas having 7 square feet of exposed projected area.

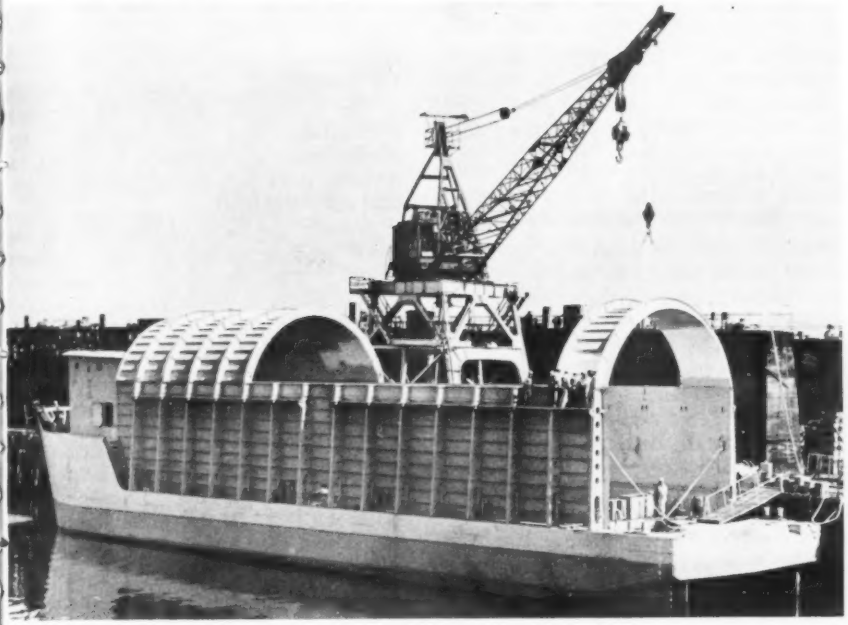
A crew of five men can erect and extend a mast, or collapse and reload it on its truck, in 20 minutes. All the power required is taken from the vehicle, a 2½-ton 6-by-6, M–46 truck chassis, which also carries the mast-handling mechanism. A simplified two-control hydraulic system is used to lift the mast out of its cradle, set it upright, plumb and level it.

A truck loaded with one mast can travel more than 50 miles an hour over unimproved roads. It can carry as many as four masts at lower speed.

The Fort Monmouth mechanical engineers have also developed a transportable 100-foot antenna tower designed to support, at full height, four 6-foot or two 8-foot paraboloid antennas, and to withstand wind velocities of up to 100 miles an hour.

General George H. Decker, Army Chief of Staff, attended ceremony in his Office at which Mr. Don R. Berlin (center), vice president and general manager of the Boeing Aircraft Company's Vertol Division, presented a model of the original Wright brothers' 1909 military plane—the world's first. Mr. Bryce Wilson, president of the Army Aviation Association, accepted the model "Scout" on behalf of the Association and the Department of the Army.

TC Designs Barge to Move Saturn Booster



Huge sea-going barge designed by U.S. Army Transportation Research Command, Fort Eustis, Va., to transport Nation's largest rocket booster to Florida.

A piece of military hardware too large to be transported by train, plane or truck, the rocket booster designed for the Army-developed Saturn will be moved this spring from the George C. Marshall Space Flight Center, Huntsville, Ala., to Cape Canaveral, Fla., in a huge sea-going barge.

The booster is 82 feet long and more than 21 feet in diameter. The National Aeronautics and Space Administration (NASA), which took over the Saturn project last spring, assigned USATRECOM the problem of designing a vehicle to transport the rocket booster 2,000 miles to the Florida missile base.

Named the "Palaemon" after a mythical Greek king's son who turned into a sea god, the barge was built by the Todd Shipbuilding Corporation's Houston (Texas) Division and delivered to Huntsville in November. Awaiting loading of the Saturn booster (date undisclosed) the 180-foot vessel has a ship-type bow with a raised forecastle, a flat-bottom midsection and a vertical-type stern. En route, the booster will be sealed in a 120 x 30 x 22-foot enclosure aft the forecastle.

Developing a lift-off thrust of almost 1,500,000 pounds, the Saturn first-stage booster consists of a cluster of eight liquid-propelled motors. Several static tests from the Space Flight Center's giant tower were achieved in 1960 and further experiments are slated this year at Cape Canaveral. "Go for record" shots of the Saturn's three stages and launch of the giant satellite are not scheduled until some time in 1962–1963.

Ordnance Develops Combustible Cartridge Case

Army ammunition which provides for complete combustion of the cartridge case when fired in a gun has been developed after five years of extensive research and engineering performed cooperatively by the U.S. Army Ordnance Corps and private industry.

The new shell, which has proved its effectiveness in a series of tests, is designed primarily for use in tank guns, but testing is underway for use in artillery shells. Ultimate aim is for its use in all Army guns. Composition of the casing is classified.

The combustible case eliminates the need for costly brass shell casing and is up to 10 times lighter than a conventional brass case, depending on ammunition caliber. In addition, it will help eliminate two nuisance problems of tank firing—the litter of hot spent cases on the tank fighting compartment floor and noxious gases released inside the turret after each firing.

Fumes presently are removed from the turret by a ventilation fan. This method is sometimes not entirely satisfactory where firing is rapid and continuous. Conventional spent cases must be thrown out of a tank by loaders whose hands are protected from the heat by asbestos gloves.

Bulk of the research and engineering work on the new shell case took place at Picatinny Arsenal, Dover, N.J., the Armour Research Foundation in Chicago, and the Ballistics Research Laboratory, Aberdeen Proving Ground, Md.

AOMC Engineers Take Safety Precautions as Initial Step in Design

Safety engineers of the U.S. Army Ordnance Missile Command (AOMC) at Redstone Arsenal, Ala., begin coping with safety programs while scientists are dreaming up a new missile system and continue their watchdog duties up to and including performance of the weapon in the field.

Henry Dyer, Safety Director of the AOMC, recently told a group of civilian safety experts meeting at Fort Worth, Tex., what this safety program entails. After pointing out that a modern missile system embraces all known engineering sciences, he said:

"It is important that all areas of the missile system be independently reviewed and a balanced technical check accomplished. The areas which we must consider include electrical, mechanical, explosives, transportability, handling, storage, personnel protection, site layouts, range safety, construction, manufacturing, shelf life and climatic conditions."

As if that were not enough, he said that there is a second phase of the safety work, an industrial safety program.

"The industrial safety program provides safety administration and other safety services to industrial areas such as shops, motor vehicle safety programs, warehousing, construction and maintenance, which would normally be found at locations such as we have in elements of AOMC."

His summation:

"When Army missiles are installed in their sites, they are safe and ready to perform the mission for which they have been assigned."

Antirads in Rubber Improve Durability Under Radiation

Research by the Rock Island Arsenal Laboratory, Ordnance Weapons Command, may help to end one of the major problems in using nuclear energy as a source of power.

The problem has been to insure an acceptable service life for rubber components which are very susceptible to radiation damage. Work in progress has revealed that the aromatic nitro compounds, a well known class of organic chemicals, may be used to inhibit effectively high-energy radiation damage, or to act as efficient "antirads." In particular, the radiation resistance of nitrile rubber has been significantly increased by incorporating in the rubber certain antirads of the aromatic nitro group.

Germfree Studies Nearing Clinic Trials

NOTE: The *Newsmagazine's* account of germfree animal studies being conducted at Walter Reed Army Institute of Research, Washington, D.C., was started in the December issue and is concluded in this article.

The First International Congress on Burn Research was held in Washington, D.C., in September 1960. Considerable attention was paid to the possibility of "burn toxins" and the use of "convalescent burn serum," that is, serum collected from animals or patients who had recovered from extensive thermal injury.

Fedorov and his coworkers in the Soviet Union had found that the serum of convalescent sublethally burned dogs significantly reduced mortality when transferred to dogs subjected to normally lethal burns. This protective effect was demonstrable both for lessening deaths due to shock and those occurring later from other causes. Fedorov concluded from his experiments that extracts of burned tissue contained antigenic material not found in extracts of normal tissue and that the transfusion of "convalescent serum" acted as a form of passive immunization.

The Russian workers prepared toxic extracts from burned skin, actively immunized animals with such extracts, and obtained sera that also lessened experimental burn mortality. Reports from the Soviet Union of trials using human convalescent burn serum in the therapy of burn patients have provided "encouraging results." The Russian investigators believe that the effective antigens come from the injured skin itself, and that the reaction is an autoimmune one.

The WRAIR Division of Surgery has confirmed that convalescent serum can reduce mortality of severely burned rats; a similar finding for mice was confirmed by workers of the National Institutes of Health. It is possible that the toxic materials, to which the convalescent serum is presumably the antibody, do not arise from the burned tissues themselves. They may represent the bacteria and bacterial products which are invariably present in the burns of conventional animals.

Experimentation with germfree animals to clarify this basic problem is underway at WRAIR. If the serum of sublethally burned germfree animals can reduce the mortality of severely burned conventional animals, then clearly the convalescent serum is not an antiserum against the bacteria or bacterial products contaminating the conventional burn. However, if the serum from burned germfree animals does not protect under conditions where serum from conventional burned animals does, a bacterial or a new microbial basis would be evident.

Metabolism and Nutrition

Many metabolic processes occurring in the animal organism may be dependent upon enzyme systems of commensal bacteria rather than on endogenous enzymes in the animal. The germfree animal lends itself superbly to the study of these problems. It is possible, through a few well-designed experiments, to obtain definite answers to a problem which requires a great number of complicated experiments when undertaken with conventional animals.

The *metabolism of urea*, the first organic compound to be synthesized (Wohler, 1828), has always interested biologists and physicians. Considerable time and effort has been expended by large numbers of investigators in laboratories all over the world attempting to determine whether the metabolism of urea in mammals was under endogenous or bacterial control. Yet the precise role of the intestinal bacterial flora remained equivocal and inferential. Indeed, as recently as 1956, Conway presented evidence before the 20th International Physiological Congress, which he interpreted as showing that the gastric urease of mice was intracellular rather than bacterial.

At the WRAIR Germfree Laboratory, C^{14} urea was injected subcutaneously or given orally to conventional and germfree rats. Urine, stools, and expired air were collected.

The conventional animal's expired air contained 100 times as much radioactivity as the germfree animal's. The pattern of urea hydrolysis in the germfree rats was the same whether the urea was given subcutaneously or intragastrically. The very small fraction of the injected C^{14} (0.02%) expired by the germfree rat is due to spontaneous hydrolysis of urea, not to enzymic breakdown. These results conclusively demonstrate that the enzymic hydrolysis of urea by the rat is effected only by the urease of its bacteria. Moreover, these results provide the experimental answer to the clinical observation that certain oral antibiotics effectively control ammonia toxicity of patients with liver dysfunction.

Considerable evidence points to a close, complex and often critical relationship between the host and the microorganisms which he normally harbors. The specific nature and significance of these relationships are as yet unexplored. An example is the role of the intestinal bacteria in the body metabolism; the host seemingly depends upon a "normal" balanced intestinal flora for the synthesis of certain micronutrients.

Dietary cirrhosis of the liver is the sixth leading cause of death among adults. The ability of certain antibiotics to delay development of experimental dietary cirrhosis of animals has led to the hypothesis that bacteria are critical for the development of this liver injury. Moreover, it has been stated that this disease is an infectious disease "conditioned" by a dietary deficiency. In collaboration with the National Institute of Arthritic and Metabolic Diseases, the WRAIR Germfree Laboratory has shown that this concept is not tenable. Germfree rats on a choline-deficient diet not only develop liver cirrhosis but they develop it faster than their conventional counterparts; thus this form of liver cirrhosis is clearly not an infectious disease, nor is the presence of bacteria in some unknown way necessary for its occurrence.

Considerable evidence links the metabolism of *cholesterol* to the pathogenesis of *atherosclerosis*, a major medical problem. Recent experiments from our laboratory and from Sweden have shown that cholesterol metabolism is markedly affected by the normal microflora of conventional animals. Investigations of the specific effects of selected microorganisms are urgently required to gain further basic insight into this disabling and death-dealing disorder which too frequently renders outstanding and battlewise personnel unfit for further combat or active duty.

Immunologic Studies

The limited antigenic experience of germfree animals makes them unique tools for the study of the fundamental reactions betwen animals, microorganisms and allergens. The potential of germfree animals will be realized fully when they can be born and raised on wholly synthetic hypo or non-antigen diets and maintained in antigen-free environments. The first group of germfree animals to be reared on a wholly synthetic diet is now an accomplished fact at the WRAIR Germfree Laboratory.

There has been a strikingly active increase in interest among investigators concerning the problem of natural resistance. It is impossible to study the

natural resistance of the host alone using conventional animals, because their uncontrollable microflora significantly alter the "natural" defense mechanism of the host.

For example, there has been controversy as to whether anti-human blood group A and B agglutinins in animals are acquired or inherited. Studies of germfree chicks at the WRAIR Germfree Laboratory showed clearly and finally that anti-human blood group B agglutinins in conventional chicks are not inherited but result from exposure of the animals to microorganisms possessing blood group antigenicity in the usual environment.

Microbiologic Interrelationships

Work at the WRAIR Germfree Laboratory has demonstrated that while the conventional guinea pig is highly resistant to experimental Shigellosis, the germfree guinea pig is singularly susceptible and rapidly dies of a severe bacillary dysentery. When germfree guinea pigs are monocontaminated with *Escherichia coli*, they are highly resistant to experimental infection, but when Lactobacillus casei (also a normal inhabitant of the conventional guinea pig's intestinal tract) is the monocontaminant, subsequent infection with Shigella leads to a fatal infection. Recent evidence has alluded to the fact that similar microbial interrelationships may be important in the etiology of cholera.

Acclimatization to New Flora

When germfree guinea pigs are moved to an open animal room, they all die of overwhelming infection within 48 hours. When germfree mice are brought to the "outside," 50 percent die within 48 hours. But when germfree rats or chickens are brought out they suffer no ills and survive as normal animals. This poorly understood phenomenon has meaning for the responses of troops when they contact certain microorganisms for the first time as they move into foreign areas.

Moreover, with the advent of space travel and exploration, it is possible that men will encounter microorganisms on other planets with which they have had no prior contact, or that new organisms will be taken to other planets by earth travelers. The germfree animal purposefully exposed to known microorganisms can aid in elucidating the mechanisms involved in and necessary for acclimatization to new microorganisms.

Application of Germfree Techniques

The Department of Germfree Research at Walter Reed Army Institute of Research is investigating the possibility of translating the techniques of the germfree laboratory to the hospital. For the past hundred years, ever since Pasteur and Lister, surgeons have been striving to advance methods and techniques which would permit them to operate under "sterile" conditions. That this goal has not been achieved is reflected in the fact that "clean" elective operations too commonly end in wound infections. Many of these are caused by contamination of the wound during operation by exogenous microorganisms in the environment. The sources of these organisms are well known; they come mainly from the respiratory tracts of the surgical team and from circulating air, and serve to make descriptions of "operating aseptically" upon man wishful fancies—not accomplished realities.

We have modified a Trexler plastic germfree isolator for our purpose of operating on large animals and man in a sterile environment. Absolute exclusion of the wound from the ordinary operating room environment is accomplished by operating through a sterile, flexible, disposable plastic chamber, glued aseptically to the surgically prepared skin.

Significant Modifications

Instruments and supplies are inside the isolator, but their supporting tables and stands are outside. The patient, surgical team, and anesthetist are outside the isolator; only the wound and underlying tissues come in contact with the sterile environment of the isolator. Among the significant modifications of the animal isolator is the substitution of helmet-jacket combinations for the conventional arm-length gauntlets; this permits free and easy movement of the surgeon and his assistants.

We have used this method successfully in operating on animals in an ordinary operating room; the isolator environment and wounds remained sterile throughout the operations. The technique is ready for trial with patients. It offers the possibility of operating in a sterile environment not only in fixed hospitals but also in field hospitals.

Other clinical applications based on the same general principle underlying the operating isolator are: (1) the isolation of patients particularly susceptible to exogenous infections such as patients purposely or accidentally exposed to serious whole body X-irradiation or administered radiomimetic drugs, (2) the isolation of patients with serious infections to prevent spread of the pathogenic microorganisms. For these last two applications, the patients would be inside the isolators; preliminary models of this type have been built and are under trial.

Attention has been called to the unique opportunity for biomedical basic research presented by the Germfree Laboratory. Investigations at the fundamental level of problems in many broad areas of paramount importance to military medicine which cannot be solved with conventional laboratory and clinical techniques can now be undertaken.

Urgent Problems

Germfree birds and rodents are currently used at WRAIR. Large mammals such as dogs, swine and monkeys will be raised soon and will increase even further the range of experiments carried out at the laboratory. Urgently needed answers to problems related to battlefield wounds, irradiation injury, chemical and bacteriological warfare, infectious disease, immunology, immuno-diagnostics, homotransplantation, metabolic and nutritional diseases, and space exploration can be sought.

The practicality of translating the techniques of the Germfree Laboratory to the care of patients has already been demonstrated with animals at WRAIR using specially designed plastic isolators. Clinical trials at hospitals will start soon.

New Process Eliminates Platemaking for Maps

A new electrostatic printing process for volume reproduction of color maps is under study at the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va. Heart of the process is a new printing machine that reproduces maps from miniature separation transparencies, eliminating platemaking and thus cutting reproduction time required by the present lithographic method.

Tests of an experimental model, built by the Radio Corporation of America, are expected to develop a 5-color electrostatic printing machine weighing the same as present equipment and capable of reproducing 2,000 multicolor maps per hour.

Named Research Director

Dr. Carl M. Herget is the new Director of Research at the U.S. Army Chemical Research and Development Laboratories, Army Chemical Center.

Affiliated with the Laboratories since 1947, Dr. Herget formerly was chief of the Biophysics Division, Directorate of Medical Research. Prior to 1947 he was at Pennsylvania State University as professor of Engineering Research and as personnel director of the Ordnance Research Laboratory.

Camp Century, City Under Ice, Operationa

Contrasts so vivid that they tax credulity are part of everyday living at Camp Century, the Army's fantastic City Under Snow in the northwest part of the immense Greenland icecap.

Here, 800 miles from the North Pole, is one of the most primitive regions on earth, but here also is a community so modern that it derives its light, heat and power from atomic energy.

Here men can work up a sweat in a fully equipped gymnasium, and may be doing so at this moment, while a few yards away from them the temperature is some 60 or 70 degrees below zero and an arctic gale howls across a lifeless barren.

Here scientists study records of the climate as it prevailed a thousand or more years ago, while at their elbow a colleague works on the forecast for tomorrow's weather.

Here 19 months ago four flags planted in the snow were the only visible evidence of the Army's plan for a unique research base. Today Camp Century is in full operation, with a complement of 110 civilian scientists and military personnel, including a Danish and an American Boy Scout.

As of November, 30 of the camp's planned 36 buildings were completed and occupied; its portable nuclear reactor was in "parallel production" with a conventional diesel-powered system and a test run of the reactor system had just been started; in the camp's laboratories a half dozen or more research projects were underway.

Construction and maintenance of Camp Century in themselves represent a major Army research project. Previously no sizable base had ever been permanently established on an icecap; research on the Greenland icecap had been restricted to the period between May 1 and Oct. 1. The problem before the Army was how to establish a year-round base where men could live, work or fight in one of the world's harshest environments.

Erection of Camp Century, under agreement with the Kingdom of Denmark (Greenland is sovereign Danish territory), was undertaken by the Polar Research and Development Center (PRDC), Corps of Engineers, Fort Belvoir, Va. The skills and capabilities of many agencies within the Corps, however, as well as in other services, contributed to its completion.

For example, the basic concept of the camp's construction was developed and first tested by the Snow, Ice and Permafrost Research Establishment (SIPRE) of the Corps of Engineers at an earlier temporary camp in Greenland. This method of construction involves cutting a trench in the snow to the desired depth and width, covering it with corrugated-iron arches and then blowing back over the arches some of the snow previously excavated. This processed snow provides a 3-foot deep cover layer which rapidly "sets up," much like concrete, leaving a stable arched roof able to withstand pressures of more than 100 pounds per square inch.

Camp Century consists basically of 21 such snow-roofed trenches. Its center corridor—"Main Street"—runs the length of the camp, almost 1,200 feet, and is 26 feet wide and 28 high. Paved with wooden planks, Main Street provides ample space for an entire tractor sled "swing," or arctic train, to pull up within the corridor and unload supplies and equipment where desired.

Running from Main Street at right angles are the camp's other trenches, which contain its living quarters, laboratories, service buildings, maintenance shops and the nuclear reactor system. Thus, except for ventilation shafts, entrances and exits, the entire camp is enveloped by the polar icecap.

The mating of the geometric pattern of snow-topped trenches and the millions of pounds of equipment and materials—most of it hauled by tractor sled from Camp Tuto, 138 miles away—called for an awesome combination of meticulous planning and on-the-spot improvization.

The building throughout all but the reactor portion of the camp are a modified version of the Corps of Engineers arctic T–5 panelized structure. Before being shipped from the United States to Greenland, they were completely prefabricated, preerected and coded down to the last section of wire in the lighting system and smallest fitting in the fire suppression, water and sewage systems. Then they were disassembled and packaged for shipment.

Heating and lighting the buildings once they had become part of Camp Century posed a problem which illustrates how one problem—and frequently its solution—led to another.

A diesel generating system that would provide the necessary lighting, heat and power would have required 825,000 gallons of fuel oil a year. To avoid the enormous cost and difficulty of transporting such an amount of fuel oil across the icecap, the Army elected to install a portable, medium-power nuclear reactor capable of producing, by powering a steam turbine plant, 1,500 kw of electricity and 1,000,000 B.t.u.'s of heat per hour.

The problem of shipping the reactor—by sea and air—was taken in stride, bu its erection and operation raised a criti cal problem and added to the seriousness of still another. The annual ac cumulation of snow on the Greenland icecap amounts to about three feet. Each year the new-fallen snow adds millions of tons of weight to the cap, compressing the snow from earlier years slowly into ice and, inexorably, causing a settling of the subsurface.

Such settlement of the glacier at the reactor site would be extremely serious if not uniform and hard to correct around the reactor vessel proper because of radiation hazards. The Engineers met the problem, at least for the initial stage, by using pile foundations and special spread-footing supports.

Installation of the nuclear reactor aggravated another problem: water supply. Camp Century, with its additional reactor demand, requires about 10,000 gallons of water per day. In previous years the only method available for supplying large quantities of water utilized a surface snow melter.

For Camp Century, however, the Sanitary Engineering Branch, Engineer Research and Development Laboratories (ERDL), Fort Belvoir, on the basis of experiments at Camp Century and at an earlier summer camp, devised a revolutionary water system.

Heated by steam, a melting-drill assembly sank a well shaft 36 inches in diameter into the glacier more than 100 feet. At that level the drill bit was replaced by a melting-pump bit assembly which by the ejection of steam created a pool of water 40 feet across and 36 feet deep. The pump bit assembly not only maintains a more or less constant supply of water in the pool, but simultaneously brings water to the surface for storage in the camp's water

(Continued on Page 22)

Camp Century views on opposite page: (1) SIPRE civilian glaciologist studies snow layers to determine annual precipitation, melt rates. (2) Lt Gen A. G. Trudeau, Chief of Research and Development, presents Army Commendation Ribbon to SFC Harlen Coffman for work on camp construction. (3) Portable nuclear power plant's vapor condenser being moved into power trench. (4) Army Engineer beside above-ground temporary shelters that housed camp construction workers. (5) Peter snow plow cutting trench. (6) Types of vehicles used in hauling equipment supplies to Camp Century and in later crossings of the Greenland icecap. (7) Equipment storage trench.

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Camp Century Surmounts Arctic Problems

(*Continued from Page 20*)

supply tanks. Steam bled off from the reactor system prevents freezing.

Solution of the heating, lighting and power problem raised, or was accompanied by, another major problem. This was protecting the snow walls and roofs of the corridors from heat given off by the buildings, particularly the two power-reactor and standby diesel-structures and the kitchen. Part of the solution to this problem lay in erecting the buildings so that a space is left between them and the snow around them.

During summer however, when the surface temperatures may exceed 32 degrees F. for several days, the problem of maintaining cool tunnels could become critical because as snow is warmed above 20 degrees it suffers a serious loss in strength. Inherent in this situation was a threat that the roof arches could give way and the foundations settle at accelerated rates.

SIPRE provided an answer by drawing air from the snow at icecap temperatures. By mounting high capacity fans over 40-foot shafts drilled into the icecap, thousands of cubic feet of low temperature air can be sucked out of the snow per minute and forced into the camp trenches to maintain lower temperatures during warm periods.

The nuclear reactor itself is cooled by large air blast cooler fans which exhaust through roof vents huge quantities of slightly heated air. As part of the camp's research program, experiments are scheduled to find out whether this waste heat can be utilized.

Thus problems foreseen and unforeseen arose, and were—and are—overcome, by slide rule or rule of thumb. Meanwhile, the men stationed at Camp Century live in comfort comparable with that of stateside posts. Their quarters are modern dormitories, not old-fashioned barracks. The insulated buildings are 12 feet high, 16 feet wide and 76 feet long. Each contains five electrically heated compartments, 12 feet wide and 13 feet long, and a recreation room.

Each compartment is furnished with double-decker bunks, rug, dresser, wall locker, mirror, comfortable chair and an overhead lamp. Fans and roof vents provide circulation of air; the icecap, itself, more than 5,000 feet thick, serves as an excellent air conditioner.

Other prefabs erected to provide creature comforts contain the gymnasium, library, post exchange, hospital, chapel, kitchen and mess hall.

Meanwhile, also, research proceeds as planned: research on the effects of living for long periods buried in snow (personnel are rotated every four months); research on the structure of snow and ice to develop techniques of using these materials for construction; research on mapping techniques and on crevasse locating, by means of electronic gear that detects minute differences of temperature.

Greenland, with 708,000 square miles of icecap, is the cradle of weather for much of the Western Hemisphere. By studying cores of ice formed through the ages scientists can read the history of climatic change covering thousands of years—and, by geographic projection, millions of square miles.

The ice cores serve as another—and more immediate—study source. Cores from a depth of 160 feet contained volcanic ashes from the great eruption of Krakatau, Dutch East Indies, in 1883. Of more recent interest, the successive layers of snow piled up after Aug. 8, 1945 contain a chronological record of atomic fallout since Hiroshima. Study of this record is part of Camp Century's research into nuclear radiation.

So far, ice cores have been brought up from a depth of almost 1,500 feet at Camp Century. Experiments are proceeding, looking toward deeper and deeper drilling, with the goal lying at the bottom of the 5,000-foot thick icecap there. Results of the camp's ice-core drilling research may, indeed, provide tools that will seek out history's secrets in the 10,000-foot thickness at the crest of Greenland's vast icecap.

It has been noted that Camp Century is a product of cooperative enterprise. Some of the agencies involved have been named; still others merit mention. The Nuclear Power Division, Office of the Chief of Engineers, through the Nuclear Field Office at ERDL, supervised the design of the reactor. The Eastern Ocean District (EOD) of the Corps of Engineers bore the responsibilty for procuring and installing the reactor plant.

The Climatic Research and Test Branch, ERDL, served as the engineering staff for PRDC and, in addition to performing camp planning functions, provided certain items for camp use. In the not distant future the CRTB is scheduled to provide Camp Century with an item that may have revolutionary impact: "Buildings in Barrels."

The concept of Buildings in Barrels is primarily a logistics one, and was originated because of the extremely difficult logistic problems encountered in the building of Camp Century. The plan now is to ship "buildings" to Camp Century in barrels of liquid plastic, at a density of 60 pounds per cubic foo On the site the chemicals are to b mixed to form a rigid building materi of plastic foam at a density of approx matcly 2 pounds per cubic foot, thu providing 30 cubic feet of building ma terial on the site for each cubic foo shipped.

The plastic may be formed into build ing blocks, or might even be sprayed over forms to construct entire build ings. Further, by use of forms, the plastic could be sprayed to make chair and other items of furniture. Far be yond its uses at Camp Century, the plastic may someday even supplant the soldier's age-old field dwelling: the tent.

Returning to participants in Camp Century's creation, SIPRE, already mentioned, served as general consultant on construction techniques and site conditions. The Washington, D.C., District, Corps of Engineers, assisted ERDL in designing the electrical distribution system. The Coast Guard, Curtiss Bay, Md., constructed and packaged the majority of the buildings and certain of the utility systems.

The Waterways Experiment Station, Vicksburg, Miss., assisted ERDL in summer test programs of the camp's features, and the Navy gave help in shipping heavy items. The Air Force transported large quantities of construction items, particularly priority items.

Today, Camp Century is a reality, "a great milestone in arctic construction," to quote Capt. Elvin R. Heiberg III, former ERDL Projects Officer at Camp Century, who contributed substantially to the foregoing account of the project.

Besides its basic function as a research center, Camp Century is also intended to be a prototype military operational base. Capt Heiberg stated:

"Successful operation of the camp will prove that the icecap has been conquered. The use of nuclear power will virtually eliminate the tremendous logistical problem which has prevented establishment of bases of any size on an icecap; and if Century can operate successfully at Mile 138, other camps can be built at Mile 400 or Mile 800.

"If Century can successfully support 100 men over a 12-month year, no doubt 400 can be supported at another camp. And an incidental but significant lesson demonstrated by the Camp Century project is that the skills of the Corps of Engineers are broad and widespread, but can successfully be brought to bear on a specific problem beyond the scope of talents of any one office—a lesson in teamwork."

Provocative Ponderables

". . . Our Army must not only be mobile in its equipment, it must be mobile in its thinking. Perhaps no other characteristic is so important in preparing us to meet the challenge of the 1960's." General George H. Decker, Chief of Staff, U.S. Army.

* * *

"The problem of defense is how far you can go without destroying from within what you are trying to defend from without." President Dwight Eisenhower.

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"Next time you pay your taxes, don't put all the blame on Uncle Sam. Put much of the blame where it belongs. Blame Communism. It costs you billions." Assistant Secretary of Defense Perkins McGuire (Supply & Logistics).

* * *

"The world is nobody's plum. It is a wrinkled old prune and will only be a charred pit unless wise and able leadership prevails and unless the peoples of the Free World stop measuring our way of life by the false gauges of material wealth and luxuries." Lt. Gen. A. G. Trudeau.

Semipalmated Plover Added To U.S. Museum Collection

"What is so rare as a day in June?" the poet asked. The answer well might be: A semipalmated plover on the Greenland icecap.

Only four members of this species of bird have been reported as having been observed in that forbidding wasteland in 113 years—the first in 1847, the second in 1863, the third in 1901.

The fourth one is now in the collection of the U.S. National Museum, Washington, D.C., the gift of Dr. Carl L. Eklund, who brought the dead bird back from Camp Century last summer.

Dr. Eklund has contributed to the collection four other birds from Greenland. These include a snow bunting and an arctic tern, which he brought last summer, and a dovekie and a Greenland wheatear, brought back in 1959. All were found dead and held for him by American enlisted men stationed on the icecap.

What the birds were doing there is conjectural, but possibly they were traveling to or from their breeding places. What that traveling involves is illustrated by the habits of the wheatear, which breeds in northern Greenland and wings its way to winter quarters in West Africa.

Webster's Dictionary defines palmate as "Having the anterior toes united by a web . . ."

Free World's Potentialities for Progress Discussed as Army Key Scientists Meet

Potentialities for progress by which the Free World can maintain superiority on the economic and scientific front in the continuing conflict with the Soviet Union and its satellites were outlined at the Tenth Meeting of Army Key Scientists.

Speaking to 90 top ranking scientists assembled at Headquarters of the Quartermaster Research and Engineering Command, Natick, Mass., Dr. James B. Edson pointed out the perils confronting the Free World. In discussing "A Pattern for the Future," he expressed confidence that the United States and its allies posses the research and development capability to keep ahead of the Communists.

Formerly Special Assistant to the Director of Research and Development, Department of the Army, and presently Senior Civilian Missiles Advisor, Office of the Assistant Chief of Staff for Intelligence, Dr. Edson discussed the relative positions of the Free World and the Soviet Union in the light of the current industrial revolution.

World War II was dominated and decided by technology, Dr. Edson said, and sparks of the industrial revolution it fired have spread so rapidly that by 1980 "only a narrow belt of the habitable world will still await its touch. This last belt will dwindle to include, by the turn of the century, only the most cruel parts of the deserts and the jungles. In the mid-21st century, the world will be approaching industrial maturity, and a new factor will be emerging dominant for human destiny. . . ."

Dr. Edson said that "this present wave of rising hopes, of change, of conflict, and ultimately of human powers, is the most certainly predictable feature of the human future." Communist countries, he said, are currently doubling their gross national product in 13 to 14 years, which appears to represent the most rapid sustained growth rate now attainable, whereas the United States requires 20 to 22 years. "If the West holds the present line of growth," Dr. Edson said, "the Communist world will almost surely remain below the West in overall productive capability, at least well into the 21st century.

". . . Even with dictatorial drives and liberal outside assistance, a nation cannot reach industrial maturity in much less than three to four doubling times—40 to 50 years. Without police-state controls upon consumption, the transition may take 60 to 70 years.

". . . The United States and, more so, the Western world need never be overtaken. It lies within our practical powers of national choice to maintain, or perhaps to increase slowly, our present lead. . . . The Russian now employs his whole strength . . . he cannot press upward more. . . . If we continue as we are, he will overmatch us at the turn of the century. At cost of some effort but no cost in freedom, we can raise our blade a little; then he cannot match us in this century. . . . If the Russian strength should flag, our task would be easier—but we must not count on it. . . .

"Army R&D faces the task of giving our Army the capability to meet a better financed, very modern Soviet force. We have to get more real capability and for less dollars than the Russians will have, or lose the race. R&D itself has to produce more, better, faster results on the present budgets—that is, the budgets of the next three or four years. We must do this so that power-in-being may reach our troops earlier, and our diplomats can hold a stronger line in the game of power politics. . . .

"To help America win, Army R&D must find, and must lead out in those new, dynamic practices which bring mastery of change. This involves unending re-education and a firm subordination of comfortable custom to the emerging needs of change. But it can be richly rewarding to the men and institutions who successfully pursue it. . . ."

Back Cover: Personalities and scenes photographed during Tenth Meeting of Army Key Scientists held at Headquarters of the Quartermaster Research and Engineering Command, Natick, Mass. (1) Dr. Harold C. Weber, presiding chairman. (2) The principal speakers: Col Allen T. Stanwix-Hay, left, Dr. James B. Edson, Col George T. Metcalf. (3) Registration desk. (4) Partaking of "quick serve" meal are (left to right) Dr. Joseph J. Thompson, Brig Gen Merrill L. Tribe, Commanding General, Headquarters Quartermaster R&E Command, Dr. Dale H. Sieling, Dr. T. R. Vallance. (5) Trio engrossed in discussion are Dr. L. E. Baker, Dr. Edson, Dr. R. G. H. Siu. (6) Materials-handling equipment exhibition receives attention.

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Scenes at Natick Meeting of Army Key Scientists


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